HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES PROGRAMS

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 500 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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72-0660. Le Moan, G. (Faculte de Pharmacie de Paris, Paris, France). **Les problemes poses par la conservation des denrees alimentaires, en particulier dans les pays du Tiers Monde. [Problems caused by food preservation in the Third World.]** *Aliment. Vie 58: 83-96; 1970.* (10 references) (French)

The problems caused by the use of pesticides reside in the various degrees of toxicity. Animal tests have revealed carcinogenic and teratogenic effects of some pesticides. Toxicity is closely connected with volatility, solubility, and stability of the pesticides. The observance of instructions of the use of pesticides is important. New products have not shown any tendency of increasing toxicity. However, the possibility of synergism should be taken into account. Pesticide residues are covered by unrealistic regulations in many countries. The inhibition of the fermentation by certain fungicides and impairment of the organoleptic properties of foodstuffs are some of the secondary effects of pesticides. In the Third World, since the intensive use of pesticides due to specific climatic conditions is required, comprehensive education to pesticide-related problems is imperative.

72-0661. Anonymous. **Autour des sujets du congres Interocean 70. [On the proceedings of the Interocean 70 Congress.]** *Ann. Biol. Clin. (Paris) 28: 363-364; 1970.* (French)

Studies of water pollution problems of the North and Baltic Seas were carried out by the International Council for the Exploration of the Oceans (ICES) in 1969 and 1970; the worst situation was found along the shipping lanes. Wastes discharged into the sea drift to the shores by sea currents in a relatively short time. In a Belgian investigation of 300 beaches in recreational areas in Europe, 44 were qualified as very dangerous, 16 as dangerous, and 24 as suspicious regarding water pollution. Fats of salt-water fish analyzed showed considerable traces of DDT. Coastal waters are covered by regulations for continental waters in many countries while extraterritorial waters are not subject to any legislation. The IMCO (Intergovernmental Maritime Consultative Organization) conference due in 1973 might accelerate a settlement in this regard. Both tourism and the increasing exploitation of the food reserves in the oceans necessitate measures to control water pollution.

72-0662. Zavon, M. R. (Dept. of Environmental Health, U. of Cincinnati Coll. of Medicine, Cincinnati, OH). **Pesticides in perspective.** *Clin. Toxicol. 4(3): 467-476; 1971.* (22 references)

In this paper, originally presented to the Section of Environmental Sciences of the New York Academy of Sciences, the author reasserts the harmfulness of emotional approaches to the questions of pesticide effects and the necessity for obtaining a far greater volume of factual information than that which is presently available before drawing conclusions on the benefits and risks of pesticide uses. He emphasizes the fact that harmful effects of long-term human exposure to pesticides have not been demonstrated, and that reported organochlorine levels in many milieus may be in error due to analytical inaccuracy. The presence of a compound in the environment cannot be equated with a given effect, he states, and plausible alternate explanations for observed phenomena must be given due consideration. He recommends that any changes proposed in existing systems, such as introduction of new chemicals or elimination of formerly used ones, be preceded and accompanied by a careful collection of the facts surrounding the actions.

72-0663. Madden, J. L. (Faculty of Agricultural Science, U. of Tasmania, Australia). **Pests, pesticides and pollution.** *J. Aust. Inst. Agr. Sci. 37(2): 168-174; 1971.* (5 references)

Adapted from Dr. Madden's 1969 presidential address to the Tasmanian branch of the Australian Institute of Agricultural Science, this article comprises a general description of pest control practices and their effects on the environment. Chemical pesticides of both the persistent (organochlorine) and rapidly degrading (organophosphate) types although currently occupying the center of public attention, are only one in a long series of actions which man has exerted on the environment in order to modify it to his own ends. Emphasis in insect control is shifting from the temporary eradication of undesired insect populations to integrated control, which entails management of these populations. Integrated control utilizes all available pest management methods in a rational, systematic manner. Chemical measures will still be employed where necessary, but in a manner which avoids disruption of the biological control effected by other organisms. They will be supplemented by the use of cultural practices such as crop spacing, crop rotation, and soil management. Such sophisticated tools as attractants, repellents, juvenile hormones, and biocides as well as plant breeding for insect resistance and establishment of parasite and predator controls on economically undesirable insects will reduce the need for chemical pesticide use.

72-0664. Anonymous. **Pyrethrin prospects.** *Nature (London) 233(5320): 441; 1971.*

Pyrethrum, a natural pesticide derived from the flowers of *Chrysanthemum cinerariaefolium* and *C. coccineum*, is highly effective against houseflies, mosquitoes and cockroaches; however, it is presently quite expensive (about $44/lb). The high cost, plus the uncertainty in the supply of the natural product, stimulated the search for synthetic analogs. The National Research and Development Corporation, Rothamstead, England, has recently developed two promising synthetic pyre-

thrins, resmethrin and bioresmethrin. Their kill rate is many times higher than that of the natural product, but their knockdown rate is lower, although still higher than that of many other insecticides. So far, this difficulty has been overcome by mixing them with natural pyrethrum and synergists. The synthetic pyrethrins seem to be safer to mammals: the acute oral LD50 in the rat of bioresmethrin is 8500 mg/kg body weight; of resmethrin, 200 mg/kg body weight; and of natural pyrethrin, 600 mg/kg body weight. Like the natural material, the synthetics degrade rapidly in sunlight and water, suggesting that agricultural applications may become attractive as the price is reduced.

72-0665. Anonymous. **Borlaug's warning.** *Nature (London) 233(5320): 444; 1972.*

At a press conference following his testimony in a public hearing on the cancellation of DDT use by the Environmental Protection Agency, Norman Borlaug, recipient of the 1970 Nobel Peace Prize for his research on high-yield wheat strains, criticized environmental activists for attacking the use of DDT and other products which increase world food supplies. He stated that once a ban on DDT has been obtained, these activists would proceed to attack other products such as hydrocarbons, organophosphates, carbamates, herbicides, and fertilizers. He states that such attacks would negate the value of his lifetime devotion of alleviating human suffering by improving crop yields. Any chemicals which are banned in the United States are likely to become unpopular in other countries, such as the developing nations. According to Borlaug, it is a tragic error to believe that agricultural chemicals are a prime factor in the deterioration of our environment.

72-0666. Anonymous. **Chemie und Umwelt. [Chemistry and the environment.]** *Naturwiss. Rundsch. 24(6): 263-264; 1971.* (German)

Chemistry protects the environment from damages which are caused by insects, air pollutants and waste water. Great care must be taken, however, not to create new dangers by trying to avert the old ones. The use of pesticides for the protection of plants and crops helps man because it prevents yield losses but it is also detrimental to him because it may kill bees which are useful to man. Humans may suffer physical damage through ingestion of corn or fruit sprayed with insecticides.

72-0667. Yamamoto, I. (Tokyo Agricultural U., Tokyo, Japan). **[Japanese-American seminar on pesticides. Pesticides and the environment.]** *Shokubutsu Boeki (Plant Protection) 26(1): 35-36; 1972.* (Japanese)

Dynamic aspects of pesticides and their analogs in the environment, effects of light and microbes on pesticides, effects of pesticides and their analogs on living things, and new approaches to pest control were the topics of discussion at a seminar held in Oiso, Japan. Four representatives reported on mercury, five on residues, five on organophosphorus and carbamate pesticides, three on photochemical reactions, two on degradation of pesticides in soil, four on the effects on living things, and three on a new approach to pesticides. In Japan, problems are concentrated mainly on DDT, parathion, BHC, mercurials, and PCP, while in the United States DDT, polychlorocyclodienes, methylmercury, dioxin, and PCB are of great concern. The proceedings and the lectures will be published later.

72-0668. Japan Plant Protection Association (Toshima-Ku, Tokyo, Japan). **[The Ministry of Agriculture and Forestry announced and gave a notice of standards of safe use of pesticides.]** *Shokubutsu Boeki (Plant Protection) 26(1): 37-44; 1972.* (Japanese)

The Ministry of Agriculture and Forestry announced the new standards concerning the measures for pesticide residue control and for prevention of damage to aquatic animals. The new standards consist of two parts; the first indicates the standard methods, and period and the times of application of designated formulations (EPN, malathion, diazinon, carbaryl) on crops under cultivation (including rice, cucumber, tomato, fruit trees) and bans the application of formulations containing DDT, BHC, and/or parathion. The second part designates the standards on the sites and the methods of application of formulations containing as active ingredients one of the 16 insecticidal, 23 fungicidal, and 17 herbicidal compounds, all of which have greater toxicities to aquatic animals. The new standards for vegetable foods will be in force on June 1, 1972 except for rice, potato, and tea, which will be in force on Oct. 1, 1972.

72-0669. The Japan Plant Protection Association (Toshima-Ku, Tokyo, Japan). **[Official notification on the ban of BHC.]** *Shokubutsu Boeki (Plant Protection) 26(1): 47; 1972.* (Japanese)

The Environmental Agency and the Ministry of Agriculture and Forestry notified the governors of Prefectures and the chiefs of District Agricultural Administrations that pesticide formulations containing the γ isomer of hexachlorocyclohexane (lindane) as the active ingredient were totally prohibited. The only alternative for future insect control is diazinon.

72-0670. Viraraghavan, T. (Dept. of Civil Engineering, U. of Ottawa, Ottawa, Canada). **Rx for pesticides: Knowledge.** *Water Wastes Eng. 9(1): A24-A25, A-32; 1972.* (10 references)

The risks and benefits to be derived from the use of pesticides are outlined briefly. It is estimated that 90% of the food grown by man could be destroyed by pests if continual wars were not waged against them. During the first 10 years of use, DDT saved about 5 million lives and prevented 100 million illnesses. Today only 5% of the world's arable area is treated with pesticides. The Taft Sanitary Engineering Center has shown the comparative toxicities of chlorinated hydrocarbon insecticides to fish. Endrin was by far the most toxic to all species of fish. The closely related compounds aldrin and dieldrin were considerably less toxic, showing that a slight change in chemical structure can greatly change the degree of toxicity. The main hazards of insecticide residues in water are: large numbers of aquatic invertebrates and fish may be killed, and the residues may be taken up into the tissues of these organisms. It has been reported that 2,4-D is not degraded materially by the microorganisms present in natural waters, but many chlorinated hydrocarbon pesticides can be degraded under suitable, biologically active anaerobic conditions; the rates were generally rapid under anaerobic conditions compared to aerobic. Water treatment processes are reviewed briefly.

72-0671. Anonymous. **Gesetz zur Aenderung des Pflanzenschutzgesetzes vom 27. Juli 1971. [Amendment of the Plant Protection Law of July 27, 1971.]** *Z. Lebensm.-Unters.-Forsch. 147(3): 58-60; 1971.* (German)

The Plant Protection Law of May 10, 1968 has been amended. The amendment of July 27, 1971 states that plant protection also includes the use and protection of animals, plants and viruses by means of which harmful organisms of diseases can be combated. The amendment also entitles the Minister of Health to prohibit or limit the application of certain pesticides, the import of seeds, plants and soil which have been treated with pesticides if there is danger to the health of man or animals. The purpose, type, time and method of application of pesticides to plants and seedlings may be regulated in cases where human health or the wellbeing of animals is affected.

72-0672. Coduro, E. (Munich, Germany). **Deutsche Demokratische Republik. Pesticidrueckstaende in Lebensmitteln. [German Democratic Republic. Pesticide residues in food.]** *Z. Lebensm.-Unters.-Forsch. 147(5): 91-94; 1971.* (German)

An excerpt of the regulation issued by the Ministry of Health of the German Democratic Republic concerning the residues of pesticides in food from June 28, 1971 is given. Two lists have been compiled giving the maximum allowable concentration of pesticides in the various types of food. For example the concentration of DDT in fruit including berries with the exception of strawberries has been limited to 1 ppm, for strawberries no DDT residues are tolerated at all; the same is true for corn. The DDT tolerance limit for potatoes is 0.1 ppm unpeeled and zero for peeled potatoes. For vegetables the DDT concentration has also been limited to 1 ppm. Lindane is tolerated in higher concentrations, 1 ppm for fruits and berries, 0.5 ppm for corn and potatoes and 2 ppm for vegetables. Endosulfan is tolerated in concentrations of 0.5 ppm in fruits and berries as well as vegetables and 0 ppm for corn and potatoes. The same tolerance limits in food products have been set for parathion.

72-0673. Wakatsuki, T. (Saku General Hospital, Saku, Nagano Pref., Japan). **[Poisoning from pesticides - A typical case of disease arising from environmental pollution.]** *Baioteku (Biotech), 2(10): 754-760; 1971.* (Japanese)

The year of 1969 was one of revolutionary change in Japanese agriculture. First, the productions of the pesticides parathion and TEPP were prohibited; the former had been used against rice insects, and the latter had been used mainly against cockroaches of fruit trees and vegetables. More than 5000 people had lost their lives accidentally or intentionally from these pesticides in the preceding ten years. Secondly, the use of phenyl mercury, a large quantity of which has been used yearly (as much as 70,000 tons) in the rice field, was prohibited. Thirdly, in December 1969, manufacturing of DDT and BHC was discontinued suddenly and voluntarily by the manufacturers of pesticides, following the prohibition of use of DDT in the United States. In January 1970, the Ministry of Agriculture and Forestry officially issued an ordinance against the use of BHC and DDT for feed crops because of the high residue rate of β-BHC in milk. The effects of the high concentration of β-BHC in milk began to appear in mother's milk in the fall of 1970, ranging from 0.07 to 0.35 ppm. In June 1971, the Ministry of Health and Welfare designated the maximum permissible β-BHC residue in milk to be 0.2 ppm. The effects of pesticide sprays, acute and chronic poisoning, cycles of environmental pollution, the process of residue and permeation, and the danger of putting priorities on production are discussed generally.

72-0674. Tatsukawa, R. (Dept. of Agriculture, Ehime U., Matsuyama, Japan). **[Environmental pollution by organochlorine pesticides.]** *Baioteku (Biotech), 2(11): 903-908; 1971.* (Japanese)

Effects of organochlorine pesticides from the standpoint of environmental protection are discussed in a very general way. Topics include: the problem of BHC and its decrease in soil since the prohibition of its use in 1970, the migrations of pollutants in marine products, milk, beef, human bodies and the migration of pollutants from agricultural villages to cities. These exclude organophosphates in general, herbicides, and dioxin. The

effects of decomposed elements of agricultural chemicals and organchlorines from sources other than agricultural chemicals are also discussed. There is an urgent need for setting of maximum permissible residue standards, and establishing the chronic toxicity of BHC and DDT.

72-0675. Borlaug, N. E. (Author address not given). **DDT, the first domino.** *Ag. Chem. Commer. Fert. 26/27(12/1): 20-23; 1971-72.*

In excerpts from a lecture presented to the Food and Agriculture Organization of the United Nations, Norman Borlaug, recipient of the 1970 Nobel Peace Prize for his efforts in increasing world food production, criticizes environmental activists for extreme shortsightedness. He pictures these activists as bemused and privileged exurbanites who quote and distort the limited number of facts at their disposal, to the possible detriment of the world's population. The concept of the balance of nature, he claims, is deceptive: any balance which exists is a dynamic, not a static one, and an attempt by man to preserve species distributions on earth exactly as they are now would be highly artificial and require more, not less, human intervention. In the case of the 129 species of birds, fish, mammals, reptiles, and amphibians listed as rare or endangered in the United States by the Fish and Wildlife Service, pesticides were mentioned as contributing factors in population reduction in only two cases. Borlaug states that any proposed ban on the use of DDT should be considered most carefully in relation to its excellent safety record, undeniable efficacy in malaria control programs, and vital role in food production, as well as the questionable nature of some of the evidence against it.

72-0676. Hill, E. G. (Pest Infestation Control Lab., Ministry of Agriculture, Fisheries and Food, Liverpool, England). **How to choose and use contact insecticides.** *Food Mfr. 46(12): 21-25, 47; 1971.*

Information on the proper use and knowledge of various properties of pesticides, the pests involved, the application techniques and correct timing and placing of the pesticides is needed in order to prevent misuse and abuse of pesticides. Since pesticide usage in food premises is largely restricted to contact insecticides, the review is concerned only with that aspect. It is shown that there is no single formulation suitable for every treatment. The more common formulations are oil solutions, emulsion (or miscible) concentrates, water dispersible (or wettable) powders, dusts and powders, lacquers, and baits. Smoke generators, aerosol cans, thermal vaporizers, and slow release resin strips may also be considered as formulations. Some of the factors which influence the choice of insecticide are toxicity to insects, toxicity to man and other animals, the persistence of the insecticide. Choice of application equipment is dictated by the insecticide formulation. Also discussed briefly are mixing and applying contact insecticides as sprays, spray nozzles, care of spraying equipment, protective clothing, personnel training, and supervision. It is emphasized that the label on the pesticide container should always be read.

72-0677. Rakhmatullayeva, M. D. (Tashkent, USSR). **Nauchno-prakticheskaya konferentsiya po voprosam okhrany zdorov'ya svyazi s shirokim primeneniyem pestitsidov v usloviyakh Uzbekistana. [Conference on scientific and practical problems involved in public health protection and the wide use of pesticides in Uzbekistan.]** *Gig. Sanit. 36(4): 115-116; 1971.* (Russian)

A meeting on problems arising from the wide use of pesticides in Uzbekistan, held in Tashkent in June of 1970 is reviewed. Topics included environmental and public health protection aspects. Conditions of pesticide application on cotton cultures were discussed along with the need for improvement of the occupational hygiene features. Environmental protection aspects were viewed in terms of pesticide circulation affecting the vitamin and microelement levels of the crops. References were made to pesticide residues occurring in food products and to their effects on the immunological condition of the human body. Practical recommendations were discussed but no specifics were included.

72-0678. Thompson, F. B. (Hamilton, New Zealand). **Insecticides: Carbamates.** *N. Z. J. Agr. 123(5): 105; 1971.*

In this section of a series on insecticides, the author, former registrar of the Agricultural Chemicals Board of New Zealand, lists the properties, uses, and restrictions associated with the carbamate insecticides. One member of this group, carbaryl, has been widely used for many years because of its low persistence. Other members of this group are more highly toxic, and their use is restricted to licensed applicators. Carbaryl has an oral LD50 of 400 mg/kg, is available as wettable powder or dust, and is registered in New Zealand for control of a large number of insects in horticulture and agriculture and of earthworms in sport greens and lawns. The oral LD50 of aminocarb, on the other hand, is 30-60 mg/kg; it is registered in New Zealand for control of codling moth, leaf roller, leaf hopper and mealy bug on stone fruits. The waiting period for harvest with this insecticide is 3 weeks. It also assists in mite control. Methiocarb or metmercapturon is used for control of sucking and chewing insects on apples, and of slugs and snails. The oral LD50 is 100-135 mg/kg and the waiting period, 3 weeks. Dermal absorption may be significant. Methomyl is registered as a systemic insecticide for control of army caterpillar on pasture, cereals, maize, and sweet corn. It is highly toxic to humans, with an oral LD50 of 17-24 mg/kg, as well as to bees. All of the carbamates are incompatible with alkaline materials.

72-0679. Thompson, F. B. (Hamilton, New Zealand). **Plant derivatives.** *N. Z. J. Agr. 123(6): 44; 1971.*

In this section of a series on insecticides, the author, former registrar of the Agricultural Chemicals Board of New Zealand, lists the properties, uses and restrictions associated with the insecticides derived from plants. Whereas, the toxicity to mammals of the best-known of these products, pyrethrum (actually a mixture of pyrethrins and cinerins), is very low, nicotine, another member of this group, is highly toxic. Both nicotine and nicotine sulfate are extracted from tobacco; nicotine sulfate is actually a mixture of various tobacco alkaloids, about 40% of which is nicotine. They are used for control of sucking insects such as flies, aphids, thrips and mealybugs. Both have an oral LD50 of 70 mg/kg and a dermal LD50 of 140 mg/kg, are toxic to bees, and require extreme care in handling. Pyrethrins are derived from plants of the chrysanthemum group and produce a true contact insecticide, which provides quick knock-down of insects and breaks down rapidly, particularly in bright sunlight. Piperonyl butoxide may be added as a synergist and stabilizer. The oral LD50 of pyrethrum is 200 mg/kg. It may also be mixed with rotenone, another insecticide derived from the plant species of *Derris* and *Lonchocarpus*. Rotenone is registered in New Zealand for control of many chewing and sucking insects on horticultural crops. Its oral LD50 is 25-132 mg/kg and it is toxic to fish and bees.

72-0680. Conner, J. (Congressional Counsel, National Agricultural Chemical Ass., Washington, DC). **Report on the legislative status of herbicides.** *Proc. West. Soc. Weed Sci. 24: 10; 1971.*

All of the State legislatures in the United States held either regular or special sessions in 1971. A total of 136 bills were up for discussion in 36 of these States, and several bills were considered in the United States Congress. The bill sponsored by the Administration (S. 745 and H.R. 4152) was being considered most seriously at the time the present report went to press. This bill, as well as the "reflected philosophy of EPA and other governmental agencies", according to the author, call for restrictions on the uses of pesticides, and the categorization of products individually and by intended use. Licensing and certification for purchase and use of pesticides are advocated by the bill's sponsors, as is the establishment of training requirements for licensed pesticide applicators. The considerations relating to cancellation of DDT registrations and the EPA hearings on the subject were also discussed in this legislative report.

72-0681. Williams, C. S. (Agricultural Department, The Dow Chem. Co., Midland, MI 48640). **The status of 2,4-D, 2,4,5-T, silvex and MCPA herbicides.** *Proc. West. Soc. Weed Sci. 24: 23-26; 1971.*

The chronological sequence of government and industry actions relating to the phenoxy herbicides is presented. The first agent in this group, 2,4-D, was developed in the mid-forties; it and related compounds, such as 2,4,5-T, silvex and MCPA, have come into widespread use for the control of broadleaved weeds in food crops, of undesirable brush species along rights-of-way, and of inedible weed and brush species on pasture and rangeland. In 1966, the USDA accounced that it would abolish the no-residue status for these herbicides. The manufacturers were to submit tolerances for residues in all treated food and feed products and byproducts by December, 1970. To achieve this goal, the manufacturers set up the Industry Task Force on Phenoxy Herbicide Tolerances. This task force worked on developing analytical methods which would permit detection of as little as 0.1 ppm phenoxy in crops, and 0.05 ppm acid or the corresponding phenol in animal tissues and milk. Protocols for milk and meat studies were established in 1969. In this year also, the first reports on the supposed teratogenicity of 2,4,5-T appeared. Subsequent studies revealed that the teratogenic effects were due to contamination of the tested 2,4,5-T preparation with 2,3,7,8-tetrachloro-dibenzo-*p*-dioxin. At the time of writing of this report, action was being awaited on the petitions for establishment of tolerances.

72-0682. Alley, H. P. (U. of Wyoming, Laramie, WY). **Factors involved in state registration: the case for state registration.** *Proc. West. Soc. Weed Sci. 24: 34-35; 1971.*

The desirability of permitting State registration of pesticides in addition to Federal registration is illustrated with the aid of an example which is relevant in Wyoming. The state of Wyoming is in the process of finalizing a state label for the use of Tordon-22K (picloram) for control of specific rangeland weeds, most important of which is Geyer larkspur (*Delphinium geyeri*), a plant which is highly toxic to cattle. The economic significance of animal mortality from poisonous plants is difficult to determine, due to a paucity of data; estimates of animal losses due to poisonous plant ingestion range from 2 to 15%. If a value of 5% is selected, then this means a loss of $13 million a year out of Wyoming's 1.3 million head of cattle, which is definitely significant. However, this is not to suggest that State registration should be undertaken lightly, or without sufficient data from research conducted by the State University, State Department of Agriculture and chemical supplier. Applicators must exercise all necessary precautions to ensure that approval of a valuable pest control tool is not lost due to carelessness.

72-0683. Sullivan, R. (Colorado State Dept. of Agriculture, Denver, CO). **Data required and mechanics of state registration.** *Proc. West. Soc. Weed Sci. 24: 35-36; 1971.*

Replies of ten states to an inquiry by the author concerning the procedures for State pesticide registra-

tion generally indicated that the registration requirements are quite uniform, and establish as the prime prerequisite proof of Federal approval and registration. In most cases, applicants for registration are required to fill out a standard application form, which generally contains spaces for information on the Federal registration number, name and address of the registrant and of the seller as this will appear on the label, brand name of the pesticide, and a complete statement of active and inert ingredients. The latter statements are regarded as confidential. Copies of the intended labeling and all advertising material included with the pesticide packaging must be submitted; in Colorado and many other states, the full statement of active ingredients must appear on the label. Additional data may be requested by the State agency if there is any question regarding the efficacy or safety of the product. Registration may be revoked at any time if a serious problem arises from use of the product. Registration is generally renewable every year, often merely requiring notification of any changes which have been made in labeling or formulation during this time.

72-0684. Walker, E. A. (Herbicides and Plant Growth Regulators Staff, Environmental Protection Agency, Washington, DC). **Problems concerned with registered herbicides.** *Proc. West. Soc. Weed Sci. 24: 36-37; 1971.*

Responsibility for enforcement of the Federal Insecticide, Fungicide and Rodenticide Act was transferred to the Environmental Protection Agency from the Department of Agriculture upon the establishment of the former in December, 1970. Some of the actions taken by this agency during the first year of its assumption of responsibility are listed. Much of the action at the Federal level has been aimed at restricting the use of herbicides. Home use of sodium arsenite was curtailed, and the labeling requirements changed to indicate that products containing more than 2% sodium arsenate or 1.5% arsenic trioxide should not be used or stored in the home. The use of sodium arsenite for aquatic weed control is being cancelled. The registrations of some mercury products for certain pesticide uses, such as seed treatment, algae control and slime control, have been cancelled or suspended; in others, the manufacturers are voluntarily withdrawing the compounds. The uses of 2,4,5-T are being restricted; the full extent of the restriction has not yet been determined. The uses of amitrole, chlordane, picloram, and dicamba are either being curtailed, or not implemented in the case of planned uses. The Environmental Protection Agency will attempt to aid those persons or industries who are faced with problems as a result of restrictions on pesticide uses.

72-0685. Curley, A. (Environmental Protective Agency, Division of Pesticide Community Studies, Chamblee, GA 30341). **Mercury in foods.** *Science 174(4013): 979; 1971.* (2 references)

This communication discusses and defends the author's use of the word "meat" in his previously published article "Organic mercury identified as the cause of poisoning in humans and hogs", *Science 172(3978): 65-67; 1971* (see abstract 71-1811) which was subsequently challenged by A. C. Kolbe's letter to the editor in the July 2, 1971 issue of *Science*. The author points out that the Food and Drug Administration (FDA) laboratories apply the "interim guideline for fish" to all meats (fish, mammals, and fowl) as a common practice among their chemists. The author's definition of "meat" is further substantiated by (1) definition in *Webster's Third International Dictionary*, (2) usage in a recent nationwide market-basket survey of pesticide residues, and (3) usage in the U. S. Federal Register up to and including the year 1969. The author again emphasized the salient feature of his original article; that the upper limits of mercury toxicity are becoming evident in areas of this country.

72-0686. Peakall, D. B.; Lovett, R. J. (Section of Ecology and Systematics, Cornell U., Ithaca, NY 14850). **Mercury: its occurrence and effects in the ecosystem.** *BioScience 22(1): 20-25; 1972.* (63 references)

The distribution of mercury contamination in the environment and its biological effects are reviewed. Since the amount of mercury released into the environment by man each year is four orders of magnitude lower than the amount naturally occurring in the ocean, the greatest hazards to man and wildlife seem to result from localized heavy contamination and from concentration in the food chain. Current mercury levels reported for biological systems all over the world are cited; significant decreases in mercury levels in fish were found within two years after banning of mercurial seed dressings and slimicides from some areas. Mercury compounds were found to cause changes in enzyme activities in man, and inhibition of photosynthesis by plankton. Some mercury compounds induce chromosomal changes *in vitro*, and the eating of mercury-contaminated fish has been statistically correlated with chromosome breakage in humans. Transplacental concentration of mercury can occur, suggesting that the currently accepted level of 0.5 ppm mercury in foods does not afford a sufficient margin of safety for the fetus.

72-0687. Anonymous. **Birds and polychlorinated biphenyls.** *Chemistry 45(2): 22; 1972.*

Commercial polychlorinated biphenyls are chlorinated hydrocarbons containing 42 to 60% chlorine and existing in as many as 50 isomeric forms. Their biological effects are similar to those of DDT; they are used industrially as heat exchangers in electrical equipment, particularly transformers, and as plasticizers in plastics. PCB levels of 1 to 100 ppb are found in nearly all plants and animals from the Atlantic Ocean, with as many as 1500 ppb in zooplankton. High PCB levels have been found in numerous bird species, including turkeys, chickens, terns, and ospreys. Some evidence of chromosomal damage and teratogenesis have been found in birds ingesting high dietary levels of PCBs. The manufacturer, however, states that no evidence of teratogenicity has been found in feeding trials with PCBs in rats, dogs and chickens, although certain other undesirable effects such as liver enlargement, reduced weight gain and eggshell thinning, respectively, were observed.

72-0688. Lahmann, E.; Herzel, F. (Institut fuer Wasser-, Boden- und Lufthygiene des Bundesgesundheitsamtes, Berlin-Dahlem, Germany). **Pestizid-Bestimmung in Luft und Niederschlaegen. [Pesticide determinations in air and precipitation.]** *Gesundh.-Ing. 92(12): 366-368; 1971.* (9 references) (German)

As the initial stage of an extensive study of airborne pesticide contamination, organochlorine concentrations in rainwater samples from Berlin-Dahlem were determined for a one-year period (June 1970-May 1971). One-month rainwater collections were extracted with hexane and examined gas-chromatographically for α-hexachlorocyclohexane (α-BHC), lindane, aldrin, dieldrin, p,p'-DDE, and p,p'-DDT. The limit of detection for the gas chromatographic procedure used was relatively high; therefore, aldrin, dieldrin, and DDE were detected in only one each out of the 12 samples, and DDT in five. The BHCs, however, were present in all samples examined: α-BHC at 183 to 839 ng/l, and lindane at 46 to 404 ng/l. The BHC concentrations are distinctly higher than those found in the United States and Great Britain in similar analyses; the other results are fairly similar. Average rainfall and solids content figures are presented for Berlin-Dahlem from 1965 to 1970.

72-0689. Unterman, W. H.; Gavrilescu, C.; Chisel, I. (Institute of Hygiene and the 2nd Obstetrics Clinic, Iasi, Romania). **Impregnarea cu DDT si DDE a organismului nou-nascutului. [Presence of DDT and DDE in the bodies of newborn babies.]** *Igiena 19(2): 69-72; 1970.* (8 references) (Romanian)

The residue levels of DDT and DDE in the adipose tissue and sebum of newborn children were determined. Twenty-three samples of adipose tissue samples were taken from stillborn children or children who died within a few days and DDT was found in the amount 1.83 ppm and DDE 2.63 ppm. In the sebum of 14 newborn infants the mean values for DDT and DDE were 0.89 ppm and 0.97 ppm, respectively. There was no correspondence between the amount of DDT present in the newborn and that of the mother's milk.

72-0690. Abdel-Gawaad, A. A.-W.; Hamad, M. A.; El-Gayar, F. H. (Plant Protection Dept., High Inst. of Cotton Affairs, Alexandria, U. A. R.). **Effect of the canal irrigation system used in the UAR on the persistence of soil insecticides.** *Int. Pest Contr. 13(4): 8-10, 28; 1971.* (12 references)

A simple percolation test was used to determine the quantities of several insecticides leached from seven different types of soil taken from various areas of Egypt. The insecticides tested were Kepone (chlordecon) endrin, Dyfonate and PP 211. Ten pounds of the soil to be tested were placed in a metal cylinder with a hole at the bottom. These soil samples were irrigated with 8 liters of water every 15 days. Fifteen days after the first irrigation, the cylinders were treated with the test insecticides. The water draining from each cylinder within 24 hours after each irrigation was tested for insecticide concentration by bioassay using *Daphnia*. The insecticides and their degradation products were leached more readily from light soils (sandy loam and calcareous sandy loam) than from heavier soils (clay loam and clay). In each case, the chlorinated hydrocarbons were leached more readily than the organophosphates.

72-0691. Berkovitch, I. (Author address not given). **Keeping track of pesticide residues.** *Int. Pest Contr. 13(6): 26; 1971.*

The Laboratory of the Government Chemist in London is performing a series of surveys on pesticide residues in man's environment. Organochlorine residues have been determined by GLC in prepared foods, human fat, wildlife, and river water, and in the theoretical total diet. Studies are proceeding simultaneously on refinements in pesticide residue analysis techniques, and the Laboratory offers an information service on this subject. Recent results in organochlorine residue studies seem to indicate a decrease compared to earlier years. Organophosphate residues in the "market basket" samples were also determined, using flame photometry. Additional work has been done on carbamate insecticides, mercury, and veterinary product residues. Even though fish accounts for 10% of total flesh consumption in Britain, mercury ingestion is not seen as an imminent threat.

72-0692. Kanazawa, J.; Yushima, K.; Kiritani, K. (Author address not given). **[Ecological pollution by insecticides, II - Environmental pollution by organochlorine base pesticides.]** *Kagaku (Science), 41(7): 384-391; 1971.* (40 references) (Japanese)

Dispersion and recirculation of insecticides, characteristics of pollution in Japan, physiochemical properties of organochlorines, toxicity of BHC, air pollution, water pollution, and soil pollution by organochlorines, disintegration, distribution, and pollution of soil by decomposed organochlorines, are discussed generally with reference to published materials. High pollution rate by pesticides is recognized not only in the villages where spraying has taken place, but also in cities. According to an American record, the total average of DDT was 0.004 ppt in a village, 4.2 ppt in a semi-agricultural area, and 37.3 ppt in cities on the East Coast. In Japan, BHC count in villages reaches between 10 and 100 ppt at the time of spray; but it is usually less than 1 ppt. In nine cities between Tokyo and Miyazaki, 0.1 ppt of BHC has been detected. In Tokyo itself, α-BHC 0.11 ppt, γ-BHC (lindane) 0.08 ppt, and δ-BHC 0.06 ppt have been measured. In general, 80% of BHC and DDT stay in the top soil (top 20 cm) in vertical distribution. Highly water soluble γ-BHC penetrates further down, but oil soluble β-BHC mostly remains in the top soil. Fortunately, in Japanese rice paddies, BHC pollution is relatively small. γ-BHC dissolves far more rapidly in rice paddies (which are 100% water), compared to dry fields with 60 to 80% water content. More than 90% of γ-BHC disappears in several weeks after a spray. Records show that the average γ-BHC concentration in western Japan is from 0.04 to 0.24 ppm except for the high residual rate area along the Ariake Sea; where the maximum is 1.8 ppm and average 0.38 ppm. In contrast, BHC residue in orchards and dry fields are stable for a long period of time. In an apple orchard of Nagano City, the top soil BHC content was 5.9 ppm.

72-0693. Kanazawa, J.; Yushima, K.; Kiritani, K. (Author address not given). **[Ecological pollution by insecticides, III - Pollution of agricultural products by organochlorine base pesticides.]** *Kagaku (Science) 41(7): 426-433; 1971.* (29 references) (Japanese)

Agricultural products absorb, not only directly sprayed insecticide residuals but also residuals in soil and water. The absorption rate of aquatic plants including rice plants is extremely high, and a high degree of concentration is effected in a short period of time. Chemicals begin to accumulate in plants first through the roots and through capillary actions and soon the entire plant is polluted. When chemicals are sprayed directly on the product, the surface area of the plant, physiochemical characteristics of chemicals, ultraviolet photolysis, temperature, wind, and rain, etc. also influence the degree of pollution. Volatile chemicals with high vaporization rate will evaporate quickly, but highly fat soluble chemicals dissolve in the wax layer of the plant coating and solidify. The rate of BHC residues in the rice plant, unpolished and polished rice, and vegetables, are reviewed by tables and graphs. A formula for calculating the total amount of BHC content in unpolished rice is examined. According to the formula, every application or spray of 200 g/l of γ-BHC (lindane) increases the residual BHC in unpolished rice by 72 to 156 ppb; but every ten day period between the time of last spray and the harvest will decrease 27 to 101 ppb of BHC. According to experiments, those organochlorines with long half-life intervals transfer into vegetables and accumulate very rapidly by repetition of sprays. Even ten years after a spray, a considerable amount of organochlorine remains in the soil and continues to be absorbed. The difference in the manner of application does not effect the amount of residue; the total quantity of usage determines the residual quantity. The order of absorption rate among vegetables from the greatest is: 1. peanuts, carrots, peas; 2. beets, turnips, cucumbers, potatoes, soy beans; 3. lettuce, radishes, celery; and 4. cabbages, broccoli, onions, eggplant, and pimientos. Soil qualities also influence the absorption rate. The rate of absorption from sandy soil is overwhelmingly higher than from other types of soil.

72-0694. Yushima, K.; Kiritani, K.; Kanazawa, J. (Author address not given). **[Ecological pollution by insecticides, IV - Pollution of animal and human bodies.]** *Kagaku (Science) 41(9): 507-519; 1971.* (80 references) (Japanese)

The process of concentration of various insecticides among living organisms and their effects are discussed generally with references to published materials. Topics include land animals, effects on birds, effects on aquatic animals, fish, water fowl, intake by cattle and pollution of dairy and meat products, organochlorines in beef and milk, and human intake of organochlorines. Cattle and other mammals consume residual pesticides through feed, and fat-soluble compounds such as organo-

chlorines accumulate in the fatty tissues of animals. Sometimes chemicals are also sprayed directly on the bodies of cattle, or chemical baths are given to cattle for elimination of flies and ticks, and chemicals enter the animal bodies through respiratory system and skin. According to the investigation of the Ministry of Agriculture and Forestry, BHC pollution of milk showed a marked geographical difference, and it ranged from 0.1 ppm to 1.0 ppm, increasing more and more in the warmer southwestern regions of Japan. These figures paralleled the quantities of BHC used in the rice paddies in various regions. The residual BHC in the dried rice plants used as coarse feed was the main pollution source. The ratios found in milk were α-BHC 19%, β-BHC 78%, γ-BHC 1%, and δ-BHC 2%. According to published reports, among meats, pollution of beef is the highest, followed by chicken, and pork shows the lowest degree of pollution. A breakdown of the BHC sources in the Japanese diet shows that 41% comes from all forms of meats, 22.3% from milk and dairy products, 12.6% from vegetables, 11.8% from grains, 5% from eggs, and 3.7% from oil and fat.

72-0695. Nuorteva, P. (Zoologisches Institut der Universitaet Helsinki, Finland). **Methylquecksilber in den Nahrungsketten der Natur. [Methylmercury in the food chain of nature.]** *Naturwiss. Rundsch. 24(6): 233-243; 1971.* (92 references) (German)

Organic mercury was used in the 1940's as a pesticide for the prevention of plant diseases. In Sweden methylmercury was used as a component in the pesticides. As a result the birds on the fields which fed on corn grains died. The mass killing was caused partly by the lethal effect of the pesticide itself and partly by storage of the methylmercury in the eggs which thus could not develop. Measures were taken by the authorities when the methylmercury contents in chicken eggs rose beyond the tolerance limit recommended for food products. In Finland methylmercury pesticides were not used at all. In later years (1964 to 1965) it was discovered that the fish in Sweden were generally contaminated with methylmercury. The woodworking industry as well as the alkali chloride industry was the source of contamination. The wood processing industry used organic mercury as fungicide for prevention of molding of the wet cellulose mass. With the waste water the organic mercury is discharged into the rivers and lakes. The methylmercury concentration measured in fish in the vicinity of these industries exceeded 1 ppm. Persons who ate fish from these polluted waters had mercury concentrations in hair, blood plasma, and blood cells which exceeded the normal concentration by a factor of ten. The maximum concentration measured in human hair was 185 ppm. The methylmercury concentration in humans returned to normal within one year when no contaminated fish was eaten. The half-life for methylmercury in Sweden was found to be 65 to 75 days which agrees with Japanese findings.

72-0696. Haux, E. H. (Bonn-Beuel, Germany). **Fremdstoffe in unserer Nahrung. [Alien substances in our food.]** *Naturwiss. Rundsch. 24(11): 489-490; 1971.* (German)

Great attention is focused on residues of herbicides and pesticides in food. An absolute absence of them in food, as the international law on food protection requires, will never be feasible. The classic pesticide, sulfur dioxide, has been withdrawn from any use because of its harmfulness. Ethylene oxide, methyl bromide, phosphine and hydrocyanic acid are used as fumigants. These compounds hardly react with the treated plant products. By means of radioactive tracers the rapid metabolization of ethylene oxide in wheat grains could be confirmed. In cocoa beans no traces of ethylene oxide were left after 10 days. More dangerous are the pesticides such as parathion and herbicides which contain 20 to 70% bispyridinium compounds such as paraquat, diquat, or morfamquat. Paraquat leaves traces of up to 8 ppm in the urine 24 hr after intake.

72-0697. Anonymous. **Pesticides.** *Mfg. Chem. Aerosol News 42(12): 62-64; 1971.* (7 references)

The section on pesticides of the 1970 Government Chemist's Report is reviewed. This report is compiled annually and represents world findings. The monitoring was confined to butters from Australia and New Zealand, beef kidney fats from Ireland and Yugoslavia, mutton kidney fats from Australia, New Zealand and U. K. Restrictions on use of DDT in Australia and New Zealand have reduced the residues in their butters, for mutton kidney fats, DDT residues fell for Australian samples but not for N. Z. This anomaly could be due to periods of drought which increased sheep ingestion of soil containing old and persistent residue. The only U. K. food sampled, mutton kidney fats showed as expected, a much lower residue of dieldrin than previously, reflecting the withdrawal of this insecticide from sheep dipping. One of the main conclusions is that the mercury content of the major foods of the national diet are extremely low and in most cases barely detectable. Both the average concentrations in most canned and fresh and shellfish are low but higher than in other foods. The overall conclusion is that there is no evidence of harm to health from present levels of mercury in food for the average consumer. Also, it has not been possible to identify in U. K. any group of people who have suffered harm from mercury ingestion. Other monitoring data for organochlorines, organophosphorus, and mercury are discussed. There are short sections on modern herbicides, vegetable pest control, and recent research from Rothamsted and Grassland Research Institute in Hurley.

72-0698. Bjerk, J. E. (Institutt for Farmakologi og Toksikologi, Norges Veterinaerhoegskole, Oslo, Norway). **Rester av klorinsekticider i proever av norsk smoer 1970. [Residues of organochlorine insecticides in**

samples of Norwegian butter, 1970.] *Nord. Veterinaermed. 23(10): 506-511; 1971.* (8 references) (Norwegian)

Since 1965, Norwegian butter has regularly been examined for organochlorine insecticide. The 1970 studies of 77 samples from four areas in Norway revealed the presence of DDT and/or its metabolites in all samples investigated. The concentrations found ranged from less than 0.01 ppm to 1.54 ppm, mean values were below 0.1 ppm except in the samples from Trondheim and Sogndal in western Norway. Dieldrin was found in 56 out of 77 samples, at concentrations below 0.05 ppm; measureable quantities of polychlorinated biphenyls (PCBs) were found here for the first time in Norwegian butter, in 16 of the samples, at up to 0.1 ppm. Aldrin was not detected, nor were lindane or other benzene hexachlorides, although small quantities of the latter could have been masked by the experimental technique. The organochlorine levels found are slightly lower than in preceding years. The particularly high values in Sogndal are presumably attributable to the former heavy use of DDT in the orchards which predominate there.

72-0699. Dalgaard-Mikkelsen, S. (Afdelingen for Farmakologi og Toksikologi, Den Kgl. Veterinaer-og Landbohoejskole, Copenhagen, Denmark). **Restsubstanser i levnedsmidler. [Residues in food.]** *Nord. Veterinaermed. 23(10): 512-517; 1971.* (Danish)

The occurrence and significance of the two major chemical contaminants of food, i.e., pesticides and drugs, are reviewed, with particular reference to whether current regulations afford sufficient protection to the consumer. There is no straightforward method for determining whether and to what extent a pesticide residue in or on a food material represents a threat to human health; however, general guidelines for chemical and biological study of pesticides make it possible to estimate the magnitude of the risk involved. The first step is a clarification of the chemical composition of any pesticide proposed for marketing: the importance of this step is demonstrated by the case of dioxin contamination in 2,4,5-T. The next step is resolution of the metabolic pathway in nature. Next come toxicologic studies, generally performed first on rodents, then on another non-rodent species, and including clinical studies at various dosage levels, metabolic studies, histological examination etc. The development of the egg inoculation method permits the study of a large number of substances and combinations economically. The establishment of tolerances in food at 1/100 of the so-called no-effect level is a questionable practice, but is used in lieu of any better procedure. In Denmark, maximum application rates per acre are established instead of tolerances. Lacking background data for establishment of acceptable daily intake figures, it is necessary to carry out residue determinations in a wide variety of foodstuffs, especially imported goods.

72-0700. Reichenbach-Klinke, H. (Zoologisch- Parasitologisches Institut der Universitaet Muenchen, Munich, Germany). **Fisch und Umweltvergiftung. [Fish and environmental poisoning.]** *Umschau 71(15): 564-565; 1971.* (6 references) (German)

In the course of a study on delayed damage produced by drugs administered to fish, alarmingly high concentration rates were found in the literature for various biocides, including the organomercury and organochlorine products. Studies on lead storage in fish have been initiated. It is noted that each type of chemical is preferentially stored in certain organs or organ systems, and produces typical injuries there; and also, that many chemicals have synergistic toxic and cumulative effects. Therefore, the author recommends the formulation of new legislation encompassing the following points: 1) establishment of lower permissible residue levels for various chemicals in water, allowing for the accumulation which occurs in fish; 2) prohibition of all pesticides (e.g., DDT) for which the concentration factor reaches 33% of the lethal dose for fish in a year; (3) prohibition of pesticide application within 50 meters of any body of water containing fish; 4) continuous residue monitoring in fish from waters containing detergents and phenols; 5) prohibition of all fish medicines, pickling solutions, fungicides and sprays containing mercury or arsenic; and more stringent controls on manufacture of drug-containing feeds and metal-containing chemicals.

72-0701. Aly, O. M.; El-Dib, M. A. (Environmental Lab., Campbell Soup Co., Napoleon, OH 43545). **Studies on the persistence of some carbamate insecticides in the aquatic environment—1. Hydrolysis of Sevin, Baygon, Pyrolan and Dimetilan in waters.** *Water Res. 5(12): 1191-1205; 1971.* (9 references)

The monoalkyl carbamate insecticides Sevin (carbaryl) and Baygon (propoxur) and the dialkyl carbamates Pyrolan and Dimetilan were analyzed in aqueous media. The rates of hydrolysis were measured with different hydroxyl ion concentrations. The dialkyl carbamates were more stable to hydrolysis than the monoalkyl carbamates as indicated by the second order rate constants 2.04×10^{2}, 3.04×10, 7.0×10^{-1}, 3.4×10^{-3} l. mol^{-1} min^{-1} for Sevin, Baygon, Pyrolan, and Dimetilan, respectively. The rates of hydrolysis at different pH values were also studied. Within the acidic pH range, all the compounds were stable to hydrolysis, however, at pH 7.0 and 8.0 measureable hydrolysis was observed for Sevin and Baygon and with rise of pH the rates of hydrolysis increased. About 99% of Sevin was hydrolyzed in 9 days at pH 8.0 and Baygon reached the same level in 107 days. It was found that Pyrolan and Dimetilan were stable within the investigated pH range. The temperature effect on hydrolysis was also investigated. The persistence of the carbamate pesticides in natural waters is greatly influenced by pH value and temperature of aquatic environment.

72-0702. Szokolay, A.; Wildbrett, G.; Bencze, K. (Forschungsinstitut fuer Hygiene, Bratislava, Czechoslovakia, und Milchwissenschaftlichen Institut der Technischen Universitaet Muenchen in Weihenstephan, Federal Republic of Germany). **Zur Stabilitaet von Carotinoidloesungen in Gegenwart insecticider Chlorkohlenwasserstoffe. [On the stability of carotenoids in the presence of hydrocarbon insecticides.]** *Z. Lebensm.-Unters.-Forsch. 148(1): 22-28; 1972.* (12 references) (German)

The influence of DDT and DDE on β-carotene and β-apo-8′-carotene was studied by extinction measurements of the carotenoids in *n*-heptane, chloroform and methanol solutions. It was found photometrically that DDT and DDE increase the decomposition of carotene. In the presence of lipids the results indicate an indirect influence of chlorinated hydrocarbons.

72-0703. Borneff, J. (Hygiene Institut, Hochhaus am Augustusplatz, D-65 Mainz, Germany). **Schadstoffe im Wasser: Herkunft, Bedeutung und Beseitigung. [Noxious substances contained in the waters, their origin, bearing and their elimination.]** *Zentralbl. Bakteriol. Hyg. I. Abt. Orig. B 155(3): 220-230; 1971.* (German)

Modern land cultivation makes extensive use of pesticides which has led to harmful consequences for the consumer. The highly toxic pesticides of the E 605 (parathion) type are less harmful because they decompose within a few days. The stable pesticides, such as DDT, are much more harmful; these pesticides are stored in the fatty tissue of humans. The concentration of DDT, lindane and dieldrin, in human fatty tissue was found to average 5 mg/kg in West Germany, 8 mg/kg in the U. S. and 13 mg/kg in the German Democratic Republic. Seventy percent of the pesticides found in humans stem from milk, meat, eggs, and only 25% from vegetables. Water is also a source for pesticide intake. The Main and Central Rhine Rivers contain on the average 0.1 mg pesticides/m^3 water. The pesticides are stored in the fish tissue and by way of the fish meal they are carried on to the poultry, cattle and then to man. Endosulfan was responsible for the last major fish kill in the Rhine River.

72-0704. Matsushima, S. (Saku General Hospital, Saku, Nagano Pref., Japan). **[Mercury pesticide levels in the environment, human body and food, and their balance.]** *Baioteku (Biotech) 2(11): 896-902; 1971.* (9 references) (Japanese)

The total mercury deposit in the soil in a rice field was measured by the dithizone method. The concentration of the phenylmercury deposit was 0.22 ppm where the pesticide had not been sprayed, but the maximum of 1.23 ppm concentration was found where it had been sprayed. When the top soil of 10 cm depth was compared with the surface, more residue concentration was found on the surface. The transition of total mercury content in rice for the last 20 years was investigated. Before the beginning of the use of mercury pesticide in 1945, the residue was 0.02 ppm; it rose to 0.06 ppm in 1955, to 0.08 ppm in 1961, 0.14 ppm in 1965. After the prohibition of its use was issued by the Ministry of Agriculture and Forestry in 1968, a drastic drop of residue to 0.07 ppm was noted. According to the Ministry's investigation, mercury concentration in rice ranges from 0.01 to 0.50 ppm in the produce from sprayed areas, with the most frequent concentration ranging from 0.1 to 0.2 ppm. In the area where alkyl mercury was sprayed, the maximum of 0.2 ppm ethyl mercuric chloride was found in Chinese cabbage, 0.1 ppm in cucumber and eggplant, 0.045 ppm in parsley and 0.024 in cabbage. A heavier concentration of mercury has been noted in the hair of Japanese compared to the hair of foreigners for several years. According to one published report, the average mercury content in the hair of 73 residents in Japan was 6.0 ppm, whereas the average for 30 Japanese living abroad was 1.89 ppm. Hair samples of 221 farmers who were engaged in pesticide spraying were measured and an average of 7.17 ppm mercury was detected in them. An increase of approximately 30% was noted after a pesticide spray operation. Mercury measurement in Japanese farmers' kidneys obtained from autopsies range from 0.137 to 2.569 ppm, an extremely high content compared to data published by European or American scientists.

72-0705. Shaw, S. B. (Biology Dept., Community Coll., Philadelphia, PA 19107). **Chlorinated hydrocarbon pesticides in California sea otters and harbor seals.** *Calif. Fish Game 57(4): 290-294; 1971.* (9 references)

Gas-liquid chromatography was used to determine levels of DDT, DDD (TDE), DDE, and total DDT residues in selected tissues of 10 sea otters (*Enhydra lutris*) and 2 harbor seals (*Phoca vitulina*) from central Californian waters. Residues were stored mainly in the fat of both species. Total residues in the fat in the sea otters ranged from 0.4 to 36 ppm net weight and 18 and 158 ppm net weight in the blubbers of the two harbor seals.

72-0706. Liu, H. J.; Silk, P. J.; Unger, I. (Dept. of Chemistry, U. of New Brunswick, Fredericton, New Brunswick, Canada). **The photodecomposition of an analogue of DDT.** *Can. J. Chem. 50(1): 55-60; 1972.* (18 references)

The photodecomposition of 1,1,1-trichloro-2,2-bis(5′-chloro-2′-methoxyphenyl)ethane (MPA) has been carried out both in solution and solid phase with exciting light > 300 nm. The major products of the solid phase photolyses are HCl and 1,1-dichloro-2,2-bis(5′-chloro-2′-methoxyphenyl)ethylene (MPE), 5,5′-chloro-2,2′-methoxybenzophenone (MPO), 1,1-dichloro-2,2-bis(5′-chloro-2′-methoxyphenyl)ethane (MPD), and 1-chloro-2,2-bis(5′-chloro-2′-methoxyphenyl)ethane (MPC). In liquid phase and in the presence of oxygen the

photodecomposition yields many products, the major ones, in addition to HCl, being MPE, MPD, MPC, and MPO. In the absence of oxygen in liquid phase only HCl MPD, MPC, and MPE were observed. In the oxygen free photolysis MPD and MPC are produced in larger quantity than MPE. A preliminary investigation has shown that MPE irradiated at $\lambda > 300$ nm also photodecomposes. A check carried out by the Canada Department of Agriculture indicates that MPA is a pesticide although it may not be as effective as DDT. (Author abstract by permission)

72-0707. Robinson, J. (Chemical Toxicology Div., Shell Research Sittingbourne Lab., Sittingbourne, Kent, England). **Organochlorine compounds in man and his environment.** *Chem. Brit. 7(11): 472-475; 1971.* (6 references)

Studies reporting appreciable concentrations of organochlorine compounds, particularly pesticides, in various parts of the biosphere have provided much of the impetus for attempts to improve environmental quality. Therefore, reliability of analysis for these compounds is particularly important, but it has been taken for granted in the past. The problem of determining chemical identity at the submicro level requires further attention, since the deductive reasoning processes often employed in such a determination provide only increasing degrees of probability, but not absolute certainty regarding the compound involved. Where questions of persistence are concerned, the chemical species under consideration must be defined as clearly as possible: organochlorine metabolites, for example, while retaining the carbon-chlorine bond, increase in hydrophilicity, and thus in ability to accumulate in the hydrosphere, but generally display reduced biological activity in comparison to the parent compound.

72-0708. Weil, L.; Quentin, K.-E.; Gitzowa, S. (Institut fuer Wasserchemie und Chemische Balneologie der Technischen Universitaet, Munich, Germany). **Zur Analytik der Pestizide im Wasser IV. Kinetik der Pestizidanreicherung in Polyaethylen. [Analysis of pesticides in water IV. Kinetics of pesticide accumulation in polyethylene.]** *Gas-Wasserfach Wasser-Abwasser 113(2): 64-66; 1972.* (8 references) (German)

Upon contact between polyethylene foils and water, which is loaded with chlorinated hydrocarbon pesticides, an accumulation of the pesticide in the plastic material takes place. This sorption process aims to achieve a state of equilibrium. The pesticide equilibrium concentration in the plastic foil is directly proportional to the pesticide concentration found in the polluted water. The pesticides sorbed on the polyethylene foil can be extracted with petroleum ether. The equilibrium concentration is reached after longer contact time with the pesticide-polluted water. In further experiments an attempt to determine the pesticide concentration of polluted water at shorter contact times, i.e. prior to equilibrium conditions was made. Five pesticides, lindane, heptachlor epoxide, methoxychlor, dieldrin, and DDT were used. A high-pressure polyethylene foil (1 X 10 cm surface, thickness 20 to 25 μ) was hung into distilled water containing between 1.00 to 0.05 mg/l of pesticides. The pesticide concentrations in the foils were determined by gas chromatography after 6, 24, 48, 76, 96, and 120 hours. The kinetics of pesticide sorption on the foils could be characterized by Fick's law of diffusion. Four of the five pesticides had a diffusion coefficient of 0.033 to 0.07 sq. cm/d, lindane one of 6.2 sq. cm/d. With the aid of this diffusion coefficient and the pesticide quantity measured in the polyethylene, the pesticide concentration of the polluted water can be determined independently from the contact time. The method is particularly suitable for water pollution monitoring.

72-0709. Donagi, A.; Kendler, J. (Div. of Air Pollution and Radiation Control, Tel Aviv, Israel). **[Environmental health problems in Israel.]** *Harefuah 81(7): 335-339, 352; 1971.* (15 references) (Hebrew)

Recent developments in the field of environmental health in Israel are reviewed with particular reference to the most important areas: water supply, solid and liquid waste disposal, food sanitation, prevention of noise, air pollution, radiation hazards and pesticides. Most of the country's water sources are polluted and almost all living organisms in them have been eliminated. Concentrations of DDT and other insecticides are increasing in Lake Kinneret.

72-0710. Yamaguchi, S.; Matsumoto, H.; Matsuo, S.; Kaku, S.; Hoshide, M. (Dept. of Public Health, Kurume U. Sch. of Medicine, 67 Asahimachi, Kurume-shi, Japan). **Relationship between mercury content of hair and amount of fish consumed.** *HSMHA (Health Serv. Ment. Health Admin.) Health Rep. 86(10): 904-909; 1971.* (12 references)

In view of the reported accumulation of mercury compounds, especially alkylmercury, in the human hair after mercury ingestion, and the high mercury contents recorded in some seafoods, an attempt was made to correlate mercury contents of hair and fish consumption among various population groups which are presumed to differ in dietary habits. The groups included Japanese living in Fukuoka on the island of Kyushu, who were assumed to meet the Japanese national fish consumption level of 84 g per day; Japanese fishermen and other male residents of Ikitsuki, an island off the coast of Kyushu, who ate considerably more fish than the Fukuoka residents; Okinawans, who eat about the same amount of fish as Japanese; other Japanese groups (psychiatric-hospital and almshouse residents) who ate less fish than the national average; American medical officers living in Fukuoka, who ate fish 3-4 times a week; Americans

living in Cleveland, Ohio; and Nepalis, who eat little or no fish. Mean mercury contents in hair from the first 3 groups were approximately twice as great as those of the next three groups, and ten times greater than those in the last group. Mercury levels in the hair were higher for males than females. In the Ikitsuki islanders, mercury levels were correlated with both age and daily fish ingestion. The reason for these correlations has been attributed to the abnormal high use of mercurial pesticides in Japan.

72-0711. Anonymous. **Les residus de pesticides dans les laits et les produits laitiers. [Pesticide residues in milk and dairy products.]** *Rev. Lait. Fr. 283: 31-35; 1971.* (3 references) (French)

The present article is part of a series "Pesticides Papers" published in *Surveyor*. Organochlorine and organophosphorus pesticides are briefly described. Pesticide contamination in milk and dairy products is discussed. Dangers involved with organochlorine and organophosphorus pesticides are discussed. Pesticides enter the human body via the digestive organs and accumulate in fatty tissues. BHC accumulation in milk fat was detected in French diary products. Various processing methods showed possible reductions in pesticide content in dairy products. Sources of the contamination of milk are treatments with pesticides in or above soil, in air, treatments of manure and seed, and concentrated cow feed. Analysis data for pesticide content in agricultural products are furnished. Maximum allowable values for pesticide content in various foodstuffs have been introduced in USA, Canada, and Switzerland. Such norms should be established also in France, and only tolerated pesticides, particularly organophosphates should be used in all areas related to milk production and processing.

72-0712. Greenberg, R. E.; Edwards, W. R. (Illinois Natural History Survey, Urbana, IL). **Insecticide residue levels in eggs of wild pheasants in Illinois.** *Trans. Ill. State Acad. Sci. 63(2): 136-147; 1970.* (9 references)

In 1966 in east central Illinois, residues of aldrin and DDT were found in 119 of 120 eggs of wild pheasants (*Phasianus colchicus*), heptachlor was detected in 61 of the 120 eggs. Average and maximum residue levels for dieldrin and *p,p'*-DDE were 0.30 ± 0.08 ppm, 2.82 ppm and 0.15 ± 0.02 ppm, 0.61 ppm, respectively. Heptachlor epoxide was observed at the maximum level of 0.40 ppm. Analysis revealed high variability in residue levels both among eggs and clutches of eggs although average values for individual pesticides appeared within "safe" range. It can be implied from these findings that chlorinated hydrocarbon insecticides are causing a widespread contamination of the pheasants' environment in this area.

72-0713. Mollweide, H.-U. (Author address not given). **Ueber die Ausbreitung von Mineraloelprodukten im Untergrund und in Grundwasserleitern. [The diffusion of mineral oil products underground and in groundwater conduits.]** *Wasserwirt.-Wassertech. 22(1): 16-19; 1972.* (13 references) (German)

Mineral oil plays an important role as a carrier for all sorts of pesticides, however, there are mainly three most used groups: the chlorinated hydrocarbons, organophosphates, and carbamates. Of the three groups, the chlorinated hydrocarbon pesticides such as lindane, aldrin, BHC, toxaphene, endrin and dieldrin are more important as far as a possible contamination of the groundwater is concerned. In contrast to the organophosphates, they have a high persistency in soil. The same is true for the carbamates but they are not used as soil insecticides. Chlorinated hydrocarbon pesticides may remain in the soil for several years. The properties of the pesticides in the soil depend on their chemical structure as well as on the humidity of the soil, on the physical composition of the sediments, on the humus content of the soil, on its oxygen contents, on the pH value and on the microorganisms present. The pesticides are generally fixed in the soil by absorption, where they are hydrolyzed and finally decomposed by bacteria. The danger of groundwater pollution by pesticides exists only when pesticide-contaminated surface water is in hydraulic connection with the groundwater.

72-0714. Garrison, A. W.; Hill, D. W. (Environmental Protection Agency, Southeast Water Laboratory, Athens, GA). **Organic pollutants from mill persist in downstream waters.** *Amer. Dyest. Rep. 61(2): 21-23; 1972.* (6 references)

The identification of two specific organic water pollutants, dieldrin and *p*-nonylphenol, in raw and treated textile waste waters was carried out in order to establish water quality criteria and methods for improving waste treatment methods for the textile industry. A survey showed that discharge from anaerobic lagoons, the waste treatment facility of carpet yarn mills, had the same concentration of dieldrin as that of the influent. This effluent averaged 0.4 mg/l dieldrin, which corresponded to an average loss of about 10% of the pesticide used. An aqueous emulsion of dieldrin is added to the scoured woolen fiber in the dyeing process at a level of one lb of dieldrin per 900 lb of wool stock. Dieldrin concentration was not reduced after passing through three one-acre anaerobic lagoons in series, 4 ft deep, with a total holding time of about seven days. Dieldrin was determined quantitatively by electron-capture gas chromatography and qualitatively by mass spectrometry. The permissible level of dieldrin for surface sources of public water supplies was set by the U. S. Public Health Service at 17 g/l. Other pollutants of textile mill wastes, such as anthraquinone blue disperse

dyes and dye carriers, were also studied. It was concluded that additional research is necessary to develop degradable substitutes or more effective treatment for those textile compounds that are not removed before wastewater is discharged.

72-0715. Grimes, D. J. (Colorado State U., Fort Collins, CO 80521). **Bioconcentration of chlorinated hydrocarbon insecticides by aquatic bacteria.** *Diss. Abstr. Int. 32(8): 4384-B; 1972.*

The prevalence of chlorinated hydrocarbon insecticide uptake by aquatic, chemoheterotrophic bacteria has been investigated. Thirteen bacterial species were initially screened for tendency to sorb and concentrate (bioconcentrate) α-chlordane, β-chlordane, dieldrin, heptachlor epoxide, and lindane. Agitated cultures grown in 1/2-strength m-Plate Count Broth were harvested after exponential growth, washed and resuspended in phosphate buffer, added to 0.1 μg/ml concentrations of each insecticide in phosphate buffer, and exposed to the chlorinated hydrocarbon insecticides (CHI) for 4 hr. Analyses of cell and supernatant extracts were accomplished by gas liquid chromatography and electron capture detection. It was learned that all of the organisms were capable of bioconcentrating the CHI. Bioconcentration, as expressed by the ratio cellular insecticide in ng/mg (dry wt) to supernatant insecticide in ng/μl, ranged from 10 for lindane by *Aerobacter aerogenes* to a high of 55,900 for β-chlordane *Caulobacter vibrioides* var. *limonus*. The amounts of cellular CHI detected and the bioconcentration ratios were observed to have the following order in magnitude: α- or β-chlordane > dieldrin > heptachlor epoxide > lindane. This decreasing order was the inverse of reported water solubilities for the CHI, and the inverse relationship was mathematically defined. The CHI were not easily removed from cells by washing (desorbing), and desorption was directly proportional to insecticide water solubility. Uptake of the CHI was rapid, near-maximum amounts being sorbed within 15 min, and pH < appeared optimal for bioconcentration as examined over the range pH 6 to 8. A mechanism for bacterial bioconcentration of CHI was proposed, and described uptake as an initial attraction of the electrophilic chlorines of CHI to non-ionic, electronegative sites on the bacterial cell surface followed by localization of the hydrophobic insecticide molecules in lipid compartments of the cell. Implications of this investigation are, that bioconcentration of CHI by bacteria might serve as a means of introducing these toxic compounds into aquatic food chains and that the bioconcentration phenomenon might lend itself as a treatment procedure for the intentional removal of residual CHI from water supplies and wastewater. (Author abstract by permission, copies of the thesis are available from University Microfilms, order No. 72-6427.)

72-0716. Anderson, J. R. (U. of Guelph, Guelph, Canada). **The activity of triazine herbicides in Manitoba and Ontario soils.** *Diss. Abstr. Int. 32(8): 4443-B. 1972.*

Field trials demonstrated that atrazine is nearly twice as effective in Ontario soils as in Manitoba soils. A growth room bioassay of atrazine and SD 15418 established a 2:1 ratio between the concentrations of both herbicides required for 50% growth reduction of barley (GR50 value) in representative soils from Manitoba and Ontario, respectively, and a 2:3 ratio between GR50 values of atrazine and SD 15418, respectively, in any given soil. Extraction of the soil fractions indicated a greater release of atrazine and SD 15418 from Ontario soils compared to Manitoba soils, again substantiating earlier observations. Qualitative differences in Humic Acid extracts from the nine soils were not detected with infrared and ultraviolet spectrophotometry. These studies established that the lower activity of atrazine and SD 15418 in Manitoba soils compared to activity in Ontario soils is dependent upon adsorption-desorption phenomena. In Manitoba soils atrazine activity is related to soil organic matter content while, SD 15418 activity is related to soil mineral content. Degradation of SD 15418 accounts for the difference in activity of atrazine and SD 15418 in any soil. (Author abstract by permission, abridged, copies of the thesis are available directly from the National Library of Canada at Ottawa)

72-0717. Sangha, G. K. (U. of Illinois, Urbana-Champaign, IL). **Environmental effects of carbamate insecticides as assayed in the "model ecosystem" — a comparison with DDT.** *Diss. Abstr. Int. 32(8): 4650-B; 1972.*

Unpleasant side effects of the use of persistent and nonbiodegradable pesticides, for example, DDT, have indicated an urgent need for persistent and yet highly biodegradable compounds and also a need of a method for assessing their biological and ecological magnifications. The present study includes development of a standardized laboratory method for rapid evaluation of pesticide biodegradability and ecological magnifications. The method consisted of the "model ecosystem," a 15 gallon glass aquarium with a terrestrial phase of quartz sand having plants (*Sorghum*), insects (*Estigmene acrea*) and an aquatic phase with algae (*Oedogonium*), plankton (*Daphnia*), mosquito larvae (*Culex p.*), snails (*Physa*) and fish (*Gambusia*) in it. The use of radiolabeled compounds in such a multifood-chain unit provided quantitative and qualitative information about the fate of the pesticides in components of the "model ecosystem" over a period of one month. In addition, comparative metabolism of six carbamates (propoxur, carbaryl, mobam, carbofuran, aldicarb, formparanate) and DDT, in the "model ecosystem," insect and other members of the food chain, was studied. Behavior of members of the food chain and some bioassay studies on them were also conducted. Propoxur was highly biodegradable and had

low residual activity in components of the "model ecosystem." Carbaryl appeared to be highly biodegradable but had persistent residual products. Mobam showed low degree of biodegradability. It was highly toxic to snails, and LC50 to *Daphnia* was 170 ppb. Carbofuran was highly biodegradable and had low residual activity in the components to the "model ecosystem." Detoxication was by hydroxylation of the molecule at various points and metabolites were found only in water. It was highly toxic to snails and mammals, and LC50 to Daphnia was 20 ppb. Aldicarb had high persistence and low biodegradability. Products of activation (sulfoxide and sulfone of Aldicarb) were recovered in water and other organisms of the "model ecosystem." Compound had high toxicity to snails and mammals, and LC50 to *Daphnia* was 350 ppb. Formparanate was highly toxic to *Daphnia* (LC50 to 32 ppb) and other organisms of the "model ecosystem." Major pathway of metabolism was through *N*-dealkylation and hydroxylation. Numerous unknown breakdown products, very toxic in nature, persisted in water and other organisms. DDT persisted in water, mosquito larvae, snails, fish and *Daphnia* at high concentrations. All components of the ecosystem had DDT, DDE and DDD as major residual products. Fish were unable to metabolize DDT, and the main source of metabolites was through the food. The LC50 to *Daphnia* was 4 ppb. From all these studies it was concluded that generally carbamates are better environmental pesticides as compared to DDT. (Author abstract by permission, edited, copies of the thesis are available from University Microfilms, order No 72-7048).

72-0718. Wood, J. M. (School of Chemical Sciences, U. of Illinois, Urbana, IL). **A progress report on mercury.** *Environment 14(1): 33-39; 1972.* (11 references)

Although some aspects of the mercury pollution problem have been more clearly defined within the past few years, legal safeguards, especially in the United States, have not yet been brought up to date. Tremendous amounts of mercury remain in sediments downstream from industrial polluters, and methyl mercury compounds are still widely used in U.S. agriculture. Industrial mercury contamination was assumed for some years to pose no serious threat, since it is present in the relatively harmless inorganic form. However, it has now been found that many microorganisms present in sediments are capable of converting inorganic mercury to the methylated form, in which it becomes concentrated in fish. Thus fish in many areas may soon become unsuitable for use as food sources. Disagreement over analytical methods for mercury have caused some confusion concerning hazardous levels in fish and sediments. Suggested methods for dealing with the sediment problem include dredging heavily polluted areas, covering the sediments in heavily polluted areas, and improving water quality to a level where microbial populations capable of converting mercury to the organic form will decrease. The latter possibility seems most desirable, since it will not create additional hazards, but will help solve other problems such as methylation of inorganic arsenic compounds.

72-0719. Ackefors, H. (Institute of Marine Research, S-453 00 Lysekil, Sweden). **Mercury pollution in Sweden with special reference to conditions in the water habitat. III. Effects of particular pollutants.** *Proc. Roy. Soc. Ser. B 177(1048): 365-387; 1971.* (71 references)

Literature on mercury pollution in Sweden was reviewed. Organic mercury compounds of both the alkyl- and aryl- types which have been used in Sweden for 10 to 20 years as fungicides in agriculture and in the pulp industry have had serious affects on animals in both terrestrial and aquatic environments. Although these two types of mercury compounds are now forbidden in Sweden, a new compound of the alkoxyalkyl type is used in agriculture. Other industrial activities now contribute to a considerable discharge of mercury into the air and water. Most of the mercury present in fish is of the alkyl type, methylmercury, which has been demonstrated to form by methylation of mercury due to bacterial and enzymatic activity. Terrestrial environment in Sweden is also contaminated with high mercury contents, as shown in wild fauna, grain-eating birds and their predators. The most serious mercury problem in Sweden today is the high mercury concentration in fish. Fish from a certain number of lakes and from extensive coastal areas on the Swedish east and west coast are now forbidden for sale in Sweden. In general, water organisms or birds feeding in the water habitat have higher "natural" contents of mercury than terrestrial wildlife. In Sweden elevated mercury concentrations have been observed in blood corpuscles, blood plasma and hair of people eating very much freshwater fish, but also the people eating saltwater fish.

72-0720. Demint, R. J.; Frank, P. A. (Crops Research Division, Agricultural Research Service, U.S. Department of Agriculture, Denver, CO). **Effect of container composition on herbicide residues in water.** *Proc. West. Soc. Weed. Sci. 24: 27-30; 1971.* (4 references)

Residue studies, especially studies of pesticide residues in water, can sustain an appreciable increase in experimental error due to degradation of the compound to be analyzed in the sample prior to workup, as well as losses of this component by sorption on the sample container wall. Therefore, optimal conditions and containers were sought for storage of samples for herbicide analysis. Adsorption is a significant route for loss of amitrole at fieldwater concentrations; storage in glass or plastic at the lowest temperature possible without freezing is recommended. In the case of dalapon, photodecomposition is the greatest threat. Therefore, storage of frozen samples, preferably in an opaque material such as high-

density polyethylene, is preferred. 2,4-D appeared stable under all conditions tested; however, frozen storage is recommended to forestall microbial action. The isooctyl ester of 2,4-D was quite stable at room temperature in glass or PVC bottles, but in most types of plastic bottles at room or freezer temperature, losses were high – up to 90% in 4 days. The butoxyethanol ester of 2,4-D was relatively stable in glass, PVC and HDP (high-density polyethylene) at room or freezer temperatures up to 28 days; LDP (low-density polyethylene), on the other hand, permitted losses of up to 30% within this time. Only glass and PVC gave good recoveries of dichlobenil under all conditions. About 10-25% of diquat was lost immediately from all samples; storage for 28 days at either temperature did not increase this figure. TCA underwent no apparent loss under the conditions investigated. Thus it is evident that individual storage studies must be carried out for each substance or sample type to be analyzed.

72-0721. Demint, R. J. (Plant Science Res. Div., Agricultural Res. Serv., Denver Federal Center, Denver, CO 80225). **Use of dye as a model of herbicide dissipation in irrigation water.** *Proc. West. Soc. Weed Sci. 24: 45-51; 1971.* (2 references)

The continuous injection of a fluorescent dye into an irrigation canal at a constant rate made it possible to study residue movement and dispersion reliably. Application of rhodamine B solution at the rate of 1 gallon per minute for 15, 30, and 56 minutes produced dye clouds approximately 2,500, 4,400, and 6,600 ft long in the Boulder Feeder Canal. The arrival of these clouds and the time required for dye-free water to pass through again were recorded at 1.25-mile intervals beginning 0.25 miles from the injection site. Dye concentrations were determined fluorometrically. The elongation of the dye clouds with downstream flow was linear; the rate amounted to 12, 18, and 18 minutes per mile respectively for the three treatment rates. Thus the dye concentration curves were asymmetrical, with increasing ratio of tailing edge to leading edge with downstream flow. Reductions in maximum concentration with downstream flow were 74, 47, and 32% respectively. Calculated dye recoveries, estimated from the areas under the curves for the last dye station, were between 81 and 94%; thus dye sorption was not excessive.

72-0722. Petrovskiy, V. V. (All-Union Institute of Experimental Veterinary Science, USSR). **Uroven' soderzhaniya i prodolzhitel'nost' vydeleniya sevina s molokom korov. [The level and duration of Sevin occurrence in cow's milk.]** *Veterinariya 46(8): 39-40; 1970.* (Russian)

Suspensions of 0.85-1% of Sevin (carbaryl) used against cattle ticks did not affect young cattle significantly, even with repeated treatment. Cholinesterase activity decreased initially but returned to normal within two days. When milk cows were treated with this suspension, residues of 0.1 to 0.3 mg/l were found in the milk, the concentration being inversely proportional to the amount of milk in a given milking. No residues were detected in the milk from cows treated with a mixture containing 0.4-0.5% carbaryl and 0.4-0.5% dicresyl (a mixture of *m*- and *p*-cresyl esters of *N*-methylcarbamic acid). This mixture was also effective against cattle ticks.

72-0723. Baymuradov, T. B. (Uzbek Research Inst. of Veterinary Science, USSR). **Dopustimyye ostatki butifosa v kormakh. [Permissible butyphos residues in feeds.]** *Veterinariya 46(8): 74-75; 1970.* (Russian)

In order to establish permissible butyphos (DEF) residues in feeds, 15 astrakhan sheep 2-2.5 yr-of-age were subjected to experimental treatment with butyphos-contaminated feeds. The first, second and third experimental group, including 4 sheep each, received 0.5 kg/day of feed contaminated with 2 mg/kg, 3 mg/kg, and 4 mg/kg butyphos respectively. The fourth group of 3 sheep constituted the control group. The experiment lasted 8 months. None of the treated groups revealed any clinical symptoms of poisoning. However, the group receiving 4 mg/kg butyphos-contaminated feed showed 20-30% decrease in blood cholinesterase activity 6 months after the beginning of the experiment. Upon dissection, (after 8 months of treatment), the sheep of this group showed necrotic foci in the liver and hemorrhagic inflammation of the gastrointestinal mucosa. The animals of the first 2 experimental groups revealed no organic alterations. The permissible limit of butyphos residues in feeds should be of 3 mg/kg.

72-0724. Saley, P. I. (Voronezh Veterinary Research Station, Voronezh, USSR). **Otsenka produktov uboya zhivotnykh pri otravlenii granozanom. [Evaluation of slaughter products from Granosan-poisoned animals.]** *Veterinariya 46(8): 102-103; 1970.* (Russian)

The largest amounts of residual mercury (Hg) were found in liver, kidney, and brain tissues from chicken and swine given Granosan-contaminated feed for 6 to 12 months. Decrease in Hg was observed 60 days following interruption of contaminated feed administration. Residual amounts of Hg remained in muscular tissue for 60-120 days and in liver and kidney tissue for 300 days following interruption of feeding. Meat, kidney, or liver kept for 2, 3, or 6 months in the refrigerator could not be decontaminated. Mice given swine liver and kidney containing 20 mg/kg Hg died within 17-20 days; their bodies contained 50-65 μg Hg. Dried feed prepared from swine liver and kidney containing 14 mg/kg Hg was given to 2 month-old cocks for 30 days (7 g meat powder daily). Upon slaughter, their livers contained 16 μg %, kidneys contained 40 μg % and muscles contained 2% Hg respectively. Thus, refrigeration or thermal treatment of meat products from granosan-contaminated feed-treated animals achieved no Hg decontamination.

72-0725. Dmitriyev, A. I. (Leningrad Inst. Veterinary Med., Leningrad, USSR). **Vliyaniye khlorofosa na kachestvo produktov uboya kur. [Chlorophos action on the quality of chicken slaughter products.]** *Veterinariya 46(8): 104-106; 1970.* (Russian)

Chlorophos (trichlofon) residue dynamics were studied in chicken following application of 150 mg/kg/hen (single dose) by spraying with 0.5% water solutions of the compound. Maximum inhibition of blood cholinesterase activity occurred 24 hr following treatment; this parameter was restored to initial levels 7 days later. Eggs laid within 24 hr following treatment contained 0.27 mg/kg residues in their white and 0.48 mg/kg chlorophos in their shell; no residues were detected in the yolk. Blood chlorophos levels were 1.4 mg/kg and 0.9 mg/kg 6 and 24 hr following treatment respectively. Muscle samples contained 1.26 and 0.96 mg/kg residues at the same intervals following treatment. Neither of the 2 categories contained any residue 2 days later. Skin samples elicited pesticide residues for 30 days; feathers had residues for 120 days and 180 days in chickens kept free or in cages respectively. Organoleptic tests and biochemical parameters (for freshness) performed on slaughter products (raw or boiled) from chickens sacrificed 1, 2, 10, or 20 days following treatment were close to those found on control material. However, chlorophos residues remained in the carcasses preserved at $-10^{\circ}C$ after 6 mo. Boiling of slaughter products in open containers destroyed any residues within 3 hr.

72-0726. Verschuuren, H. G. (Laboratorium voor Toxicologie van het Rijksinstituut voor de Volksgezondheid, Bilthoven, The Netherlands). **Residu's van bestrijdingsmiddelen. [Pesticide residues.]** *Voedingsmiddelentech. 3(4): 1-5; 1972.* (7 references) (Dutch)

The general situation in the Netherlands with respect to pesticide residues on foods is reviewed. First, the nature and significance of pesticide residues as they pertain to food are discussed: it is pointed out that pesticide residues in or on foods may be undesirable from both toxicologic and quality viewpoints. The general principles governing the establishment of tolerances for pesticide residues in the Netherlands are outlined, and a table of examples of established tolerances presented. In the Netherlands, the scientific data supporting the establishment of tolerance levels and acceptance or rejection of pesticides are supplied by the Commission for Phytopharmacy. Finally, the fate of pesticide residues during food processing, e.g., canning, drying and freezing, is discussed.

72-0727. Sakamoto, F.; Niki, Y.; Ide, A.; Watanabe, H. (Dept. of Agricultural Chemistry, Faculty of Agriculture, Ehime, U., Matsuyama City, Japan). **[The degradation mechanism of PCP in paddy soil II. The degradation product of PCP, Part 2.]** *Nippon Nogei Kagaku Kaishi (J. Agr. Chem. Soc. Jap.) 46(1): N7-N8; 1972.* (Japanese)

At the Joint-Meeting of the West Japan and Kansai branch of the Agricultural Chemical Society of Japan it was shown by gas chromatographic and by gas chromatographic-mass spectrometric analysis that PCP was reductively dechlorinated in paddy field soils to 2,3,4,5-, 2,3,5,6-, 2,3,4,6-tetrachloro-, 2,3,5-, and 2,4,5-trichloro-, 3,4- and 3,5-dichloro, and 3-chlorophenol.

See also 72-0661 72-0664 72-0668 72-0670 72-0671 72-0672 72-0673 72-0677 72-0743 72-0752 72-0758 72-0779 72-0804 72-0811 72-0814 72-0823 72-0824 72-0830 72-0832 72-0833 72-0834 72-0835 72-0840 72-0843 72-0847 72-0859 72-0860 72-0868 72-0869 72-0870 72-0871 72-0872 72-0873 72-0874 72-0875 72-0877 72-0886 72-0887

72-0728. Willems, J.; Vermeire, P.; Rolly, G. (Dept. of Pharmacology, Dept. of Internal Medicine and Dept. of Anesthesiology, U. of Ghent Medical School, Ghent, Belgium). **Some observations on severe poisonings with organophosphate pesticides.** *Arch. Toxikol. 28(3): 182-191; 1971.* (25 references)

Four severe human poisonings, three with Nitrostigmin (E 605, parathion) and one with diazinon (Basudine, Protex), were observed. Three patients took the poison orally. They died respectively 11 days, 64 hr and 22 hr after poisoning. The fourth patient was intoxicated by cutaneous absorption and recovered. Treatment consisted in the administration of high doses of atropine. The oximes were given in repeated doses. Cholinesterase reactivation, absent in the three fatal cases but, present in the fourth patient, is discussed in relationship to the poisoning and the oxime therapy. As complications of the poisoning hypothermia, acidosis, hypokalemia, hepatic damage, necrosis of skin and mucosae, and sudden death in cardiac asystole are described. (Author abstract by permission)

72-0729. Hearn, C. E. D.; Keir, W. (Occupational Health Serv. and Agricultural Dept., Caroni Ltd. (Tate and Lyle Ltd.), Trinidad, West Indies). **Nail damage in spray operators exposed to paraquat.** *Brit. J. Ind. Med. 28(4): 399-403; 1971.* (9 references)

From a group of 296 spray operators on a sugar estate in Trinidad, 55 persons were noted to have nail damage due to contamination by dilute paraquat. Transverse white bands of discoloration were most common but loss of nail surface, transverse ridging, deformity of nail plate, and loss of nails also occurred. The three fingers most affected were the index, middle, and ring, probably due to leakage from the knapsack sprayers. Proper maintenance of spraying equipment and simple hygienic precautions can prevent these occurrences. Even workers exposed to dilute paraquat should have a medical examination. Subsequent nail growth is normal following cessation of further exposure, confirming that the nail lesions are the result of a local action.

72-0730. Gehring, P. J. (Toxicology-Chemical Biology Res., Dow Chemical Co., Midland, MI 48640). **The cataractogenic activity of chemical agents.** *Crit. Rev. Toxicol. 1: 93-118; 1971.* (224 references)

In this review article on the mechanisms of and evidence for cataractogenic effects of various chemicals, several pesticide chemicals are cited. In the discussion of experimental techniques, it is noted that the cataractogenic activity of substances such as dicloran, which produces cataracts only in animals housed outdoors, and thus exposed to ultraviolet light, may be overlooked under laboratory conditions. Cataract production in man has been reported after topical application of miotic anticholinesterases such as paraoxon and DFP; studies in laboratory animals have failed to elucidate the mechanism involved. Cataract development after diquat exposure was proposed to result from formation of the free radical of diquat following penetration into the lens; cataract development was not observed after exposure to paraquat, which also forms a free radical, but presumably does not penetrate into ocular tissues. Miscellaneous chemicals briefly mentioned as possible cataractogens include thallium, *p*-dichlorobenzene, and heptachlor.

72-0731. Mukhtarova, N. D.; Kustyuk, O. T. (Inst. Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **K nevrologicheskoy kharakteristike ostrogo vozdeystviya polikhlorpinena no organizm cheloveka. [Acute effects of polychloropinene on the human body: neurological features.]** *Gig. Tr. Prof. Zabol. 15(9): 14-17; 1971.* (5 references) (Russian)

An incident of accidental poisoning with polychloropinene in 111 workers on a collective farm produced symptoms of varying intensity, generally within the first two hours after exposure. The patients were hospitalized for clinical observation, treatment, and assessment of physiological parameters. Vegetative changes were noted in most cases; symptoms were indicative of lesions involving the craniocerebral nerves along with the reflexive, motor and sensory spheres. Clinical manifestations consisted of the asthenovegetative syndrome, polyneuritis, encephalopathy and encephalopolyneuritis, accompanied by irritation of the diencephalic region. Preclinical lesions of the nervous system were characterized by changes in norepinephrine and epinephrine excretion and prevalence of sympathotonic reaction following functional vegetative tests performed prior to appearance of symptoms. Recovery and rehabilitation depended on the severity of the symptoms. (Author abstract edited)

72-0732. Komarova, A. A.; Zotkina, V. P. (F. F. Erisman Inst. of Hygiene, Moscow, USSR). **Ob ispolzovanii elektromiografii i nekotorykh pokazateley atsetilkholinovogo obmena dlya otsenki sostoyaniya zdorovya rabochikh, zanyatykh v proizvodstve tsirama. [Application of electromyography and of certain parameters of acetylcholine metabolism for the evaluation of the condition of workers engaged in the manufacture of ziram.]** *Gig. Tr. Prof. Zabol. 15(9): 17-20; 1971.* (14 references) (Russian)

Biochemical and electromyographic examinations performed on a group of workers exposed to prolonged occupational contact with ziram revealed shifts in blood cholinesterase and pseudocholinesterase activities. A tendency toward accumulation of acetylcholine in the blood was noted, along with changes in the bioelectric activity of the muscles during voluntary motion. These results indicate that ziram may act as a cholinesterase inhibitor in man. These procedures appear to be sufficiently sensitive to permit early detection of toxic effects of ziram. (Author abstract edited)

72-0733. Mehta, A. B.; Shah, A. C.; Joshi, L. G.; Kale, A. K.; Vora, D. D. (Dept. of Medicine, Lokmanya Tilak Municipal General Hospital, Sion, Bombay, India). **Clinical features and plasma acetylcholinesterase activity in poisoning with insecticidal organophosphorous compounds.** *J. Ass. Physicians India 19: 181-184; 1971.* (10 references)

The clinical features and the estimation of plasma cholinesterase activity were studied to determine their values as aids in the diagnosis and prognosis of poisoning with insecticidal organophosphorus compounds. Fifty cases of acute poisoning were studied. The active ingredient in each case was diazinon. Abdominal pain, vomiting, giddiness, and miosis were the most common symptoms. Twenty-two clinical features were tabulated together with the number of cases for each symptom. Plasma cholinesterase activity was estimated in 23 cases by Michail's method and was found in every case to be 70% of normal. It was concluded that when clinical findings and history are not suggestive, the estimation of plasma cholinesterase activity would suggest the correct diagnosis.

72-0734. Wadia, R. S.; Karnik, V. M.; Ichaporia, R. N. (Dept. of Medicine, Ruby Hall Hospital, India). **Cholinesterase levels in diazinon poisoning.** *J. Ass. Physicians India 19: 185-191; 1971.* (22 references)

The effects of pyridine-2-aldoxime methiodide (PAM) on the cholinesterase levels following poisoning by diazinon were studied. Ten patients were given intraveneous injections of PAM. At the same time full doses of atropine were administered. The blood levels for cholinesterase were estimated at hourly intervals by the method of De la Huerga. It was found that the medication caused a rapid recovery in cases of diazinon poisoning. The recovery was generally more rapid than when atropine was used alone. In some cases, particularly those with muscle paralysis and respiratory distress, the drugs were life-saving. PAM caused reactivation of cholinesterase levels depressed by diazinon. The rise in serum cholinesterase was small, transient and not invariable. The rise in RBC cholinesterase was faster, more complete and more long lasting. Clinical recovery occurred without rise in serum cholinesterase. The possible mechanism of the action of PAM was discussed.

72-0735. Hill, E. F.; Eliason, D. A.; Kilpatric, J. W. (Center for Disease Control, Lab. Div., Savannah, GA 31402). **Effects of ultra-low volume applications of malathion in Hale County, Texas.** *J. Med. Entomol. 8(2): 173-179; 1971.* (26 references)

As part of a program to deter arbovirus buildup and transmission by control of the vector mosquito, nine ultra-low volume aerial applications of malathion at the rate of 214 g/ha were made on three towns in Hale County, Texas, between June and August, 1967. Studies were conducted to assess the effects of this application method on nontarget insects, fish and birds. Nontarget insects were sampled with a sweepnet and a vehicle-mounted trap; avian studies consisted of mist net sample counting and searches for dead birds, as well as sparrow brain cholinesterase assays. Fisheries studies were limited to observations for indications of anomalies or mortality. The insect orders Homoptera and Hemiptera declined during the treatment period, whereas other insect orders, including Diptera with the exception of Culicidae, were not affected. Population studies and cholinesterase assays on sparrows gave values within the normal range. No effects on fish were observed, and concentrations in water only reached levels which could offer a threat to fish in one instance. It is thus concluded that low-volume aerial application of malathion for mosquito control is sufficiently safe to nontarget fauna to justify its use, although beekeepers should be notified to cover beehives during application.

72-0736. Satoh, H.,; Hashimoto, A.; Yamagiwa, J. (Dept. of Comparative Pathology, Faculty of Veterinary Medicine, Hokkaido U., Sapporo, Japan). **[Pathological features of osmose poisoning in a cow: neurological observation.]** *Jap. J. Vet. Sci. 33: 89-105; 1971.* (49 references) (Japanese)

Histopathological examinations were performed on organs and tissues, especially nervous tissues, taken from a one-year-old crossbred Holstein cow which died about 4 days after the onset of symptoms of osmose (fluor chrom arsenate phenol) poisoning. Supplementary studies were performed on mice experimentally poisoned with osmose. The principal abnormalities found were multiple hemorrhages over the entire body, microvascular alteration, polyneuropathy, cerebral edema and degeneration of nerve cells in the CNS, fatty degeneration of the liver and edema of the gall bladder, destruction of lymphocytes in the lymphoid organs, ulceration of the forestomach and abomasum, and decrease in the number of cellular elements in the bone marrow. Arsenic and fluorine could not be detected histochemically. Based on comparison of results in mice and in the cow and on the morphological observations, certain abnormalities in the cow were judged to have been present prior to poisoning, and to have facilitated the manifestation of the abnormalities following poisoning. These predisposing factors included part of the polyneuropathy, part of the microvascular alteration, part of the ulceration in the forestomach and abomasum, and part of the myopathic process in the striated and smooth muscles.

72-0737. Canlorbe, P.; Vassal, J.; Job, J. C. (Hospital St. Vincent de Paul, 74, avenue Denlert-Rochereau, F-75-Paris-14E, France). **Essai de traitement d'un syndrome de Cushing par l'*o,p'*-DDD chez l'enfant. [Therapeutic trial of *o,p'*-DDD in case of Cushing's syndrome in a child].** *Sem. Hop. 47(39): 2271-2278; 1971.* (17 references) (French)

A case of Cushing's syndrome in an 11-year-old boy was diagnosed on the basis of clinical features, hormone excretion levels, adrenal cortex inhibition and stimulation dynamics, and loss of the plasma cortisol cycle. Treatment with *o,p'*-DDD was perfectly tolerated. Chemotherapeutic control of the disease was exercised for 20 months, with normalization of clinical and laboratory signs. During treatment, marked hyperpigmentation and gynecomastia developed, indicative of hyperpituitarism. These signs improved when the drug was stopped for two months. An attempt to resume the *o,p'*-DDD treatment after the reappearance of Cushingoid symptoms was unsuccessful; adrenalectomy was required. Surgery and recovery were without complications. Thus *o,p'*-DDD appears to be a valuable adjunct to the surgical treatment of Cushing's syndrome, especially when administered preoperatively for 1-2 months to improve the patient's ability to withstand the operation. At present, it does not appear suitable for use as the sole therapy.

72-0738. Fiskac, A.; Husak, S.; Jelinek, O. (Brno, Czechoslovakia). **Otravy psu rodenticidnim pripravkem Dirax (α-naftylthiomocovina). [Poisoning of dogs by the rodenticide Dirax (α-naphthylthiourea).]** *Veterinarstvi 21(1): 31-32; 1971.* (Czech)

Instances of poisoning of dogs who swallowed bait containing the rodenticide ANTU contained in the Czech commercial preparation Dirax are comparatively frequent. The clinical picture is not characteristic and resembles that of other poisonings. First symptoms can appear within an hour, including loss of liveliness, accelerated heart action, respiratory difficulties, nausea, vomiting, excessive salivation, bloody diarrhea, and weakness leading to pareses. Body temperature remains within normal limits. Pulmonary edema and circulatory failure will kill the animals within 12 hours. Surviving animals have a favorable prognosis. Clinical diagnosis must be based on an anamnesis. Therapy is unpromising, the application of emetics and stomach pumping usually comes too late, and there is no specific antidote. The LD50 of ANTU for dogs is 10-40 mg/kg live weight. It is less toxic for young animals than for grown ones and particle size plays a role: the larger the ANTU particle the higher its toxicity per mg. The administration of sublethal quantities induces heightened resistance to ANTU. The most characteristic anatomical symptom is a hydrothorax. Other symptoms include hyperemia of the tracheal mucous membrane, alveolar pulmonary edema, actue gastritis, duodenitis, bilateral hyperemia of the kidneys, and enlargement of the liver. ANTU can be detected in the intestinal tract within 24 hours following ingestion by the Dybing or Cugajev reagent applied to an acetone extract.

72-0739. Vinogradov, A. F. (Clinical Pediatrics Dept. N. I. Pirogov Medical Inst. Moscow, USSR). **Klinika i neotlozhnaya terapiya ostrykh sluchaynykh otravleniye fosfororganicheskimi soedineniyami u detey. [Clinical picture and emergency therapy in acute accidental organophosphate poisoning in children.]** *Vopr. Okhr. Materin. Detstva. 16(9): 35-39; 1971.* (6 references) (Russian)

Accidental organophosphate poisoning in children is very dangerous, since these compounds are highly toxic. Victims of severe organophosphate poisoning pass through three stages of symptoms, characterized, respectively, by excitation, hyperkinesis with convulsions, and paralysis. Organophosphates cause three types of toxic effects: muscarinic (salivation, bronchorrhea, myosis), nicotinic (myofibrillation, hyperkinesis, tonoclonic convulsions) and central (profound coma). Each of these effects must be combatted by the application of antidotes or supportive measures. Cholinesterase reactivators such as the oximes should be administered as necessary, and pulmonary edema combatted by bronchial aspiration, glucocorticoid administration and diuresis. Specific antidotes for nicotinic effects include pentaphen, arthan, magnesium sulfate and pipolphan, and for muscarinic effects, atropine, metacine and tropacine.

72-0740. Maes, R. (Institute of Pharmacy, U. of Leuven, Louvain, Belgium). **Chemical epidemiological aspects of pesticides.** *Arch. Belg. Med. Soc. Hyg. Med. Travail Med. Leg. 29(4): 244-253; 1971.* (16 references)

The chemical aspects of pesticide poisoning are reviewed. Particular emphasis is placed on the fact that a large variety of pesticide types are available, singly and in combination, thus making the diagnosis and treatment of pesticide poisoning extremely difficult. The toxicity of a single compound may be modified by the vehicles or solvents used in formulation; the content of impurities, intermediates and isomers; combination with other compounds; environmental interactions; and drug and therapeutic combinations. Pesticide classifications and the environments in which they are likely to occur are listed. The problems of chemical epidemiology are complicated by the use of pesticides in unusual manners or environments; certain false assumptions which must be avoided in diagnosing pesticide intoxication are listed. Diagnostic improvements are being attained by wider availability and use of laboratory test methods and instrumentation. Further study is necessary in the areas of pesticide residue evaluation in postmortem tissues, and detecting secondary consequences of pesticide exposure, such as accidents resulting from impairment of judgment.

72-0741. Charnilas, J.; Israeli, R.; Cristal, N.; Stern, J. (Central Negev Hosp. and Dept. of Industrial Medicine, Kupot Holim, Beersheba, Israel). **[Poisoning by organophosphorus insecticides in Israel.]** *Harefuah 81(5): 231-235; 1971.* (36 references) (Hebrew)

There were 198 cases of poisoning by organophosphorus insecticides in Israel during the years 1961 to 1967. Most of these cases were agricultural workers, however, there were a few cases of accidental exposure and of attempted suicide. Parathion was responsible for 67% of these cases followed by malathion, 24% and phosphamidon, cotnion (azinphosmethyl), diazinon, and Metasystox (methyl demeton) accounting for the remainder. The routes of entry of the pesticides were either inhalation or direct skin contact. In most cases, ignorance of the toxicity and neglect of safety precautions were the direct causes of poisoning. The high mortality rate (eight fatalities in 36 severe cases) was due either to misdiagnosis or to inadequate doses of specified antidotes; the use of contraindicated drugs; or inadequate supportive care. Three fatal cases that illustrate these factors are described in detail. The need for awareness by the medical profession and the public for immediate treatment is stressed as is the need for an extensive informative campaign on organophosphorus insecticides.

72-0742. Tadjer, G. S.; Dore, I. (Dept. of Toxicology, Leopold Greenberg Inst. of Forensic Medicine, The Hebrew U., Jerusalem, Israel). **[Possibility of contamination of bottles used by food industries by insecticides.]** *Harefuah 81(8): 385; 1971.* (4 references) (Hebrew)

Endrin and dieldrin poisonings were diagnosed in two 3-week-old infants. Milk bottles in which endrin and dieldrin were stored cannot be thoroughly cleaned by the usual procedures in the dairy. When these bottles are filled with milk, pesticide residues can be carried to the consumer. Possibility of murder and negligence was ruled out and the only explanation for the infant deaths is the presumption that the pesticide residues remaining in the milk bottles was the cause.

72-0743. Anonymous. **Oekologische Wirkungen des Vietnam-Krieges. [Ecological effects of the war in Vietnam.]** *Naturwiss. Rundsch. 24(2): 73-75; 1971.* (7 references) (German)

Defoliants have been used in Vietnam since 1962. Mangroves proved to be particularly sensitive to defoliants. One application can kill an entire forest. Occasionally a regeneration of these trees can be observed. Rubber trees are not killed by the defoliants but latex production is impaired. Nothing is known about the toxicity of the defoliants to animals; there is no proof that they are toxic to animals or humans. However, one of the defoliants used in Vietnam 2,4-D is known to be toxic to fish. The lethal dose for salmon at 24 hr exposure is 0.5 ppm. A concentration of 458 g/l defoliant (somewhat higher concentrations are used in Vietnam) in a small river would expose the fish to 100 times the lethal dose. Another danger to animals is the ingestion of plants sprayed with defoliants. Animals grazing on such plants were reported to become ill or die. Sublethal concentrations of the defoliant may influence the metabolism of certain plants in a way which leads to an accumulation of toxic quantities of nitrates. In the animals the nitrates are then converted to nitrites which react in the blood with the hemoglobin. The resulting lack of oxygen in the tissue may cause death or disease. Observations in Vietnam, however, brought no hints of direct toxic effects of the defoliants on either animals or man.

72-0744. Durkin, J. J. (Cooperative Extension Service, New Mexico State U., Las Cruces, NM). **Use pesticides safely.** *N. Mex. State U., Cooperative Extension Service, Circular No. 438, June 1971. 6 p.*

This circular illustrates the fundamentals of safe pesticide use, storage and application for the benefit of home gardeners and homemakers. Following label instructions and avoiding skin contact and inhalation as well as contamination of dishes or pet feeding bowls can prevent accidental ingestion. Pesticides must always be stored in their own containers, in a location inaccessible to children and pets. The suggested method of pesticide and empty container disposal is by burial. If this is not practical, the containers should be wrapped in several layers of newspaper and placed in the trash can. Surplus pesticides should not be flushed into sewage or septic tank systems.

72-0745. Conner, J. T. (National Agricultural Chemicals Association, 1155 Fifteenth St., N. W., Washington, DC 20005). **Report on the National Agricultural Chemicals Association.** *In Proceedings; National Working Conference on Pesticide Disposal, Beltsville, Maryland, June 30-July 1, 1970. (Distributed by National Technical Information Service PB 197 145) p. 12-26.*

Factors to be considered in pesticide disposal are: good housekeeping practices, control and recovery methods for waste prevention, and general disposal methods. Specific methods of waste treatment and disposal are outlined for chlorinated hydrocarbons, organic phosphates, carbamates, dithiocarbamates and phenoxy acids, salts, and esters. The subcommittee also furnished a suggested procedure to follow in the event of a fire in a storage area containing pesticides. An emergency procedure for handling accidental spills of Class B poison pesticide chemicals is given. Finally, there is a section on container inspection procedures. These include container specifications, selection of container supplier, pre-filling inspection and filling line inspection.

72-0746. Witt, J. M.; Capizzi, J.; Staton, W. S.; Goulding, R. L. (Oregon State U., Environmental Health Science Center, Corvallis, OR 97331). **Considerations preliminary to development of a waste pesticide management system.** *In Proceedings; National Working Con-*

ference on Pesticide Disposal, Beltsville, Maryland, June 30-July 1, 1970. (Distributed by National Technical Information Service PB 197 145) p. 85-88.

The ideal solution to the problems of waste pesticides and waste pesticide containers involves a sequence of events leading to re-use or ultimate disposal of containers and degradation of pesticides. Each of the parts of this sequence must be carefully considered to ensure environmental, personnel, and public safety. These four main components in a waste pesticide management system are discussed: waste transport to accumulation sites, accumulation site, ultimate disposal, and monitoring system. It should be recognized that the problem of waste management of pesticides is not likely to become more critical in the future than it is today. Current projections indicate increased pesticide usage, but it can be expected that these will be the pesticides that are less persistent and more readily degraded. Eventual changes in packaging and merchandizing are also probable. These developments may have some effect upon future siting requirements and management criteria.

72-0747. Tabor, E. C. (National Air Pollution Control Administration, Environmental Health Service, U. S. Department of Health, Education and Welfare, 5721 Dragon Way, Cincinnati, OH 45227). **Air pollution problems of pesticide disposal.** *In Proceedings; National Working Conference on Pesticide Disposal, Beltsville, Maryland, June 30-July 1, 1970. (Distributed by National Technical Information Service PB 197 145) p. 99-101.* (4 references)

Air pollution in pesticides disposal is not restricted to the pesticides themselves, but to containers, treated materials, and soil residues. Other factors which must be considered are chemical nature of the pesticide, its stability or persistence, physical state, vapor pressure, uses, and residues on target systems. The total impact on air quality in a given situation will depend on the amount of and type of material to be disposed of at a particular point. The three methods of disposal are: combustion, disposal by burying, and disposal of the vast amounts of biocides left as residues on vegetation, debris, and in the soil. The latter method is the most difficult insofar as air pollution is concerned. There appears to be no satisfactory method for disposing of pesticides as wastes without contributing to air pollution. Final satisfactory resolution of the total problem will require the combined efforts and cooperation of industry, agriculture, and Federal, State and local environmental protection agencies.

72-0748. Shuman, F. L. (Agricultural and Biological Engineering Dept. Mississippi State U., State Coll. MS 39762). **Incineration technology progress report.** *In Proceedings; National Working Conference on Pesticide Disposal, Beltsville, Maryland, June 30-July 1, 1970. (Distributed by National Technical Information Service PB 197 145) p. 103-107.*

Research on incineration of pesticides is one phase of an ongoing project of a study on equipment and methods for decontamination and disposal of pesticides being conducted under a USDA grant. Objectives of the study are: to determine the combustion temperatures and the volatile products of selected pesticides, to investigate the use of chemicals and other materials as aids in the decomposition of pesticides and containers, to investigate the use of indigenous soil microflora as an aid in the decomposition of pesticides in soils, to determine the requirements for pesticide containers that are readily combustible, and to develop specifications for an incinerator or other device for the disposal of pesticides and containers. The major effort to date has been concentrated in the model-prototype studies relating to incineration as a method of disposal for leftover pesticides.

72-0749. Putnam, R. C. (Foster D. Snell, Inc., Florham Park, NJ 07932). **Investigation of the necessary conditions for proper decontamination and combustion of organic pesticides and pesticide containers.** *In Proceedings; National Working Conference on Pesticide Disposal, Beltsville, Maryland, June 30-July 1, 1970. (Distributed by National Technical Information Service PB 197 145) p. 108-119.*

Methods of combustion applicable to pesticide residues and their containers were investigated and a means for their destruction which would keep environmental pollution to a minimum was devised. It was found that the destruction of pesticides was generally aided by oxidizing agents. Binders were also found to be effective in their destruction, and it was discovered that the combination of oxidants and petroleum oil binders was no more effective than the oil binders alone. By using polyethylene which under heating or combustion conditions softens or degrades to products of lower molecular weight, the advantages of a liner and a binder were obtained with one material. A practical system was devised which consisted of burning the pesticide in a flattened polyethylene bag on or surrounded by other combustible material.

72-0750. Breidenbach, A. W. (Div. of Res. and Development, Bureau of Solid Waste Management, Environmental Health Service, Dept. of Health, Education and Welfare, Rockville, Maryland 20825). **Application of solid waste research to pesticide disposal.** *In Proceedings; National Working Conference on Pesticide Disposal, Beltsville, Maryland, June 30-July 1, 1970. (Distributed by National Technical Information Service PB 197 145) p. 120-123.*

The application of solid waste research is focused on five aspects of pesticide disposal: recycling, combustion, thermal degradation, land disposal, and sea dis-

posal. At the present time two recommendations are made for disposal: incineration or pyrolysis under carefully controlled time and temperature conditions which have been demonstrated to provide effective detoxification and disposal, and disposal in a well-designed and operated sanitary landfill with adequate surveillance. Plans for additional research and development include: investigation of the effects of pesticides upon the earth's environment and ground water when disposed of in well-designed and operated sanitary landfills, investigation of the results and effects of pesticides upon incineration processes and equipment and air quality when burned in a well-operated incinerator of modern design and construction, and development of better alternatives for disposal of pesticides and their containers.

72-0751. Rakhmatullayev, N. N. (I. M. Sechenov Med. Inst. Dept. Communal Hygiene, Moscow, USSR). **Gigiyenicheskaya kharakteristika nematotsida nemagona v svyazi s sanitarnoy okhranoy vodo yemov. [Hygienic characteristics of Nemagon in terms of sanitary protection of water reservoirs.]** *Gig. Sanit. 36(3): 19-23; 1971.* (5 references) (Russian)

Aqueous solutions of Nemagon (dibromochloropropane) are highly stable. The threshold value for Nemagon in water, based on organoleptic detection, is 0.01 mg/l. Concentrations of up to 3 mg/l have no effect on the biochemical oxygen demand of water. Because of its low toxicity, the limit to Nemagon concentration in water is established by its effect on the organoleptic properties of water, and is recommended as 0.01 mg/l. (Author abstract edited).

72-0752. Martson', L. V.; Pilinskaya, M. A. (All-Union Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **K gigienicheskoy kharakteristike usloviy truda pri proizvodstve tsirama. [Hygienic characteristics of working conditions in production of ziram].** *Gig. Sanit. 36(3): 107-108; 1971.* (4 references) (Russian)

Hygienic aspects of working conditions in a ziram production plant were studied. Concentration of ziram in the atmosphere was determined. Samples were collected on filters with electroaspirators. Ziram concentration in the air was determined colorimetrically, and varied between 0.77-3.7 mg/m^3. Washout from hands of workers contained 0.02 mg/cm^2 of ziram. Ziram concentration in a respirator used by workers for protection of respiratory organs was rather high. Thus the existing protective measures do not sufficiently protect skin and respiratory organs of the workers in a ziram production. Study of the medical records of periodical medical examinations revealed that the pathology of sight, skin, and upper respiratory organs was most frequent. No hematological alterations were found.

72-0753. Matokhnyuk, L. A. (Kiev Scientific Research Inst. Occupational Hygiene and Diseases, Kiev, USSR). **Toksichnost' fungitsida maneba pri ingalyatsionnom puti postupleniya v organism. [Maneb toxicity following inhalational exposure.]** *Gig. Sanit. 36(5): 22-26; 1971.* (11 references) (Russian)

The toxic concentration for a single dose of maneb by the respiratory route is 700 mg/m^3, and for repeated administrations, the toxic concentration is 300 mg/m^3. The single-dose threshold concentration is 15 mg/m^3, and the threshold concentration for repeated exposure is 4.7 mg/m^3. These conclusions are based on studies of some general indices (weight, blood cell morphology, phagocytic activity of neutrophils) and indices pertaining to oxidative processes (SH-group and pyruvate level in the blood, succinic dehydrogenase activity in the organs, and blood ceruloplasmin activity). No embryotoxic effects were detected in albino rats exposed to maneb at concentrations of 4.7 and 30 mg/m^3. It is suggested that the maximum allowable concentration for occupational exposure to maneb be established at 1 mg/m^3. (Author abstract edited)

72-0754. Kaskevich, L. M. (All-Union Scientific Research Inst. Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **Sostoyaniye zhelchevyvodyashchikh putey u letno-tekhnichekogo sostava zanyatogo na aviatsionno-khimicheskikh rabotakh. [The condition of the biliary tract in pilots and technicians handling chemical poisons.]** *Vrach. Delo 1: 133-136; 1971.* (Russian)

An elevated incidence of biliary tract disorders was found in pilots and aircraft technicians working with pesticides of the organochlorine and organophosphate groups. Chronic cholecystitis-cholangitis developed insidiously in many cases, and duodenal intubation might permit earlier diagnosis if more widely employed. Prophylactic and therapeutic measures against hepatobiliary damage are suggested. (Author abstract edited)

72-0755. Timofeyeva, N. T. (Kiev Research Inst. Occupational Hygiene and Diseases, Kiev, USSR). **Sluchay intoksikatstii vsledstviye sochetannogo deystviya yadokhimikatov. [A case of poisoning from combined action of toxic compounds.]** *Vrach. Delo 4: 140-141; 1971.* (Russian)

A 47-yr-old patient with chronic hepatitis and encephalomyelopolyneuritis is described. The man had been handling organochlorine compounds such as hexachlorane (BHC) and DDT for 14 yr and was exposed periodically to organophosphorus compounds such as chlorophos (trichlorfon), naphthyl thiourea (ANTU), zoocoumarin, and zinc phosphide. The progressive trend of the diffuse pathological process of the nervous system (both central and peripheral) with evident symptoms of liver damage and the presence of DDT in blood indicate the toxic etiology of the disease. The patient was not an

alcohol consumer and the peculiar complex of symptoms was attributed to the combined action of chemical poisons.

72-0756. Model', A. A.; Zaritskaya, L. A. (Kiev Research Inst. of Occupational Hygiene and Diseases, Kiev, USSR). **Klinicheskaya kartina otdalennykh posledstviy ostroy intolsikatsii polikhlorpinenom. [Clinical symptomatology of remote sequelae of acute polychlorpinene intoxication.]** *Vrach. Delo 9: 134-137; 1971.* (Russian)

Mild forms of polychlorpinene intoxication lead to nervous disorders which develop in the remote period following the intoxication. The patients showed a gradual advance of the pathological process with development of polymorphous neurological syndromes (polyneuritis, pathology of the diencephalon, subcortical ganglia, microfocal symptoms of the encephalopolyneuritis type). Diffuse disorders of cortical neurodynamics were revealed by electroencephalographic studies. The degree and character of these disorders depend on the prevailing site of the pathological process.

72-0757. Rappoport, M. B. (Kiev Research Inst. of Occupational Hygiene and Diseases, Kiev, USSR). **Elektromikroskopicheskoye issledovaniye sadney doli gipofiza pri mnogokratnom vozdeystivii pestitisidom Sevinom. [Electron microscopic study of the posterior lobe of the hypophysis during multiple effect of the pesticide Sevin.]** *Vrach. Delo 9: 137-140; 1971.* (6 references) (Russian)

Structural changes were observed in the posterior lobe of the hypophysis of animals exposed to Sevin (carbaryl) for a long period of time. These changes were studied by electron microscopy. These structural changes include: polymorphism of the elementary granules of neurosecretory fibers and their endings, irregular distribution and different electron density of the granules of neurosecretory endings, and a significant amount of pinocytotic vesicles in the cytoplasm of endothelial cells of the capillaries. These capillaries ensure traveling of neurosecretory hormones from the neurosecretory endings into the blood.

72-0758. Ramade, F. (Laboratoire de Zoologie de l'Institut National Agronomique, Paris, France). **Les oiseaux, des pesticides et la mort... [Birds, pesticides and death...]** *Sci. Progr. Decouverte 3427: 24-35; 1970.* (4 references) (French)

Investigations of the regression of the avian fauna in highly developed areas due to the application of pesticides are reviewed. Phytosanitary treatments cause acute poisoning to adult birds due to inhalation, cutaneous contact, or ingestion, the latter being dominant. The sensitivities of different species to diverse pesticides are compared on the basis of the LD50 of DDT. Aldrin, dieldrin, heptachlor, phosphamidon, and parathion are more dangerous than DDT. In England, 2.2-26 ppm of dieldrin and 5.5-53 ppm of heptachlor were found in bird muscles. Organomercurial residues 900 times the maximum allowable limit in human food were revealed in wild birds in Sweden. Pesticides also cause chronic poisonings to birds through the contamination of the alimentary chains of diverse ecosystems. Such indirect effects are more intense on carnivora than on herbivora. Considerable decrease in birds such as *Pandion haliethus, Accipiter nisus, Aquila chrysaetos, Haliethus leucocephalus* was due to alterations of the reproductive function by pesticide residues. The egg shells found were both fragile and thin due to alterations of calcium deposition, and the eggs were too light. The prohibition of dangerous pesticides, primarily of organochlorines, and their substitution by less harmful products such as phosphorus esters or carbamates, should be considered.

72-0759. Stieglitz, R.; Schuettmann, W.; Stobbe, H. (I. Medizinische Klinik des Bereichs Medizin der Humboldt-Universitaet, Berlin, Germany). **Panmyelophthisin durch berufsbedingte Noxen. [Panmyelophthisis from occupational exposure to toxicants.]** *Deut. Gesundheitsw. 26(20): 910-916; 1971.* (54 references) (German)

In 68 cases of panmyelophthisis, a cause could be detected in 30 cases. Of the latter, 18 cases are dealt with in which vocational factors were responsible. Prior to their disease, 14 patients were exposed to organochlorine plant protectives and insecticides (DDT, lindane). Intracutaneous tests and animal experiments in which BHC and DDT-incubated patient serum was injected revealed a thrombocyte and leucocyte drop of more than 60%. These studies support the assumption that these injuries are of both a toxic and allergic nature. Of the two most widely used pesticides in the German Democratic Republic, lindane and DDT, the former is more involved in the development of hematological diseases. This fact deserves more attention because lindane is frequently used in place of the outlawed DDT.

72-0760. Schubel, F.; Linss, G. (Der Hals-Nasen-Ohren Klinik und der Hautklinik der Ernst-Morotz-Arndt-Universitaet, Greifswald, Germany). **Inhalationsallergie durch Fungizid "Zineb 80". [Inhalation-induced allergy by the fungicide Zineb 80.]** *Deut. Gesundheitsw. 26(25): 1187-1189; 1971.* (6 references) (German)

An inhalation-allergy was reported to have been caused by a fungicide thought to be non-toxic to warm blooded animals and man. After two hours of work on a field pre-treated with Zineb 80, a 43-yr old female manifested allergic symptoms (sore throat, globus-sensation, pain when swallowing, nausea, temperature increase, feeling of inner unrest). Forty-eight hr later the patient manifested a dangerous edema of the laryngeal opening and was given specialized medical treatment. An inhala-

tion test proved the sensitizing effect of the fungicide. Special precautions should be taken at work on cultivated fields pre-treated with fungicides.

72-0761. Gibel, W.; Gummel, H.; Wittig, G. (Institut fuer Krebsforschung der Deutschen Akademie der Wissenschaften zu Berlin, Robert-Roessle-Klinik, 1115 Berlin-Buch, Lindenberger Weg 80, Germany). **Potentielle Karzinogene in Nahrungs-und Genussmitteln und ihre moegliche Bedeutung fuer die Genese der Tumoren des Gastrointestinaltraktes. [Potential carcinogens in food and stimulants and the importance for the genesis of tumors in the gastro-intestinal tract.]** *Deut. Gesundheitsw. 26(48): 2253-2257; 1971.* (41 references) (German)

Very little is known about the etiology of tumors of the gastro-intestinal tract. More than half of the gastro-intestinal tumors are caused by exogeneous factors; the type of food ingested plays an important role. Several carcinogens contained in food are known today; they are the aromatic hydrocarbons, nitrosoamines as well as mycotoxins. Also certain pesticides and insecticides which are ingested with food are potential carcinogens, these are: the arsenates, aramites, maleic hydrazide, DDT and several organophosphorus insecticides. Insufficient research does not at the moment permit an exact evaluation of the extent that these chemicals contribute to gastro-intestinal tumors.

72-0762. Erben, H. K.; Krampitz, G. (Author address not given). **Eischalen DDT-verseuchter Voegel: Ultrastruktur und organische Substanz. (Eggshells of birds contaminated with DDT; ultrastructure and organic matter.)** *Akad. Wiss. Lit., Mainz, Abh. Math.-Naturwiss. Kl. 2: 31-52; 1971.* (34 references) (German)

Although the physiological sequence which leads to induction of pathological eggshell production by DDT has been largely resolved, the questions concerning the ultrastructure and possible changes in the organic substance of such eggshells had not previously been answered. An examination of the membrana testacea and the eggshell itself in the case of pelicans *(Pelecanus occidentalis* and *Pelecanus crispus)* from California, chronically exposed to DDT, demonstrated a definite alteration in shell protein composition, but apparently not in the "active sites" in the organic mineralization matrix which regulate calcification of the eggshell. The reduction in thickness under the influence of DDT has little effect on the membrana testacea and the mamillary layer, but does involve the spongy layer and the external zone. The most striking change consisted of a substantial reduction in the size of the globular inclusions in the spongy layer, which were then found in far larger numbers and much more closely packed in a unit thickness of eggshell. This could both result from the eggshell thinning due to carbonic anhydrase activity inhibition, and co-act with it in producing fragility of the shell. This indicates that the influence of DDT is manifested in the uterus rather than the isthmus of the oviduct.

72-0763. Albeaux-Fernet, M. (Author address not given). **Les inhibiteurs de l'hormono-synthese corticosurrenalienne. [Inhibitors of adrenocortical hormone synthesis.]** *Annee Endocrinol. 22: 5-11; 1970.* (14 references) (French)

Metopirone and *o,p'*-DDD (TDE) affect adrenocortical hormone synthesis. Both 17-OH and 17-ketosteroid biosynthesis are blocked by Metopirone resulting in increased blood levels of 11-deoxycorticosterone. Metopirone has a functional reversible effect on the adrenal cortex. The effects of *o,p'*-DDD, include inhibition of hormone biosynthesis accompanied by degeneration. The secretion of 11-deoxycorticosterone, 17-OH, and 17-ketosteroids are reduced while ACTH secretion is increased. In cases of Cushing's Syndrome, treated with dexamethasone and *o,p'*-DDD, the latter was effective in alleviating hyperadrenocorticism with minimum necrotic effects on the adrenal. For this reason, it is primarily indicated in cancer cases, however it does not affect the growth of the carcinoma. It is also specifically indicated for non-malignant adrenocortical hyperfunctions although it is not a rapid as antithyroid therapy. Individual sensitivities to *o,p'*-DDD vary. Joint administration of *o,p'*-DDD and anticoagulants is contraindicated.

72-0764. Piazolo, P.; Franz, H. E.; Brech, W.; Walb, D.; Wilk, G. (Zentrum fuer Innere Medizin und Kinderheilkunde der Universitaet Ulm und Chemisches Untersuchungsamt der Stadt Stuttgart, Germany). **Behandlung der Thalliumvergiftung mit der Haemodialyse. [Treatment of thallium poisoning by hemodialysis.]** *Duet. Med. Wochenschr. 96(29): 1217-1222; 1971.* (21 references) (German)

Over the past few years several cases of thallium poisoning have been reported. The lethal dose for adults is 0.2 to 1.0 g. The symptoms of thallium poisoning begin to show 2 to 48 hours after intake with abdominal cramps, and hemorrhagic gastritis. After 2 to 5 days, neurological symptoms such as somnolence to coma, tremor, paresthesia and paralysis appear. After two to three weeks alopecia sets in, the nails change and breathing ceases. One such case of a 16-year-old girl was reported. Hemodialysis and forced diuresis are the treatments indicated.

72-0765. Anonymous **What causes cancer on the farm?** *Med. World News 13(2): 424; 1972.*

Confirmation of previous hypotheses suggesting an increased incidence of leukemic diseases among farmers in comparison to the general population was provided by a statistical study of death certificates in the states of Washington and Oregon. Certificates listing causes of

death in the leukemia-lymphoma group (International Classification of Diseases, 7th revision, numbers 200 to 204) were matched with certificates listing other causes of death for persons of the same age, sex and race (20-plus, male and white respectively). The ages and occupations of both members of the matched pair were then punched into tabulating cards and the frequency of farming occupations calculated for the leukemia- and non-leukemia groups. Excesses of deaths due to leukemia were found especially found among poultry farmers, but also among wheat, cattle and dairy farmers, orchardists, and nurserymen. The differences in leukemia frequencies between the farm and nonfarm groups also segregated with respect to age and pathologic type of leukemia. Multiple myeloma also occurred more frequently in the farm workers. This naturally raises the question of whether agricultural environmental agents such as pesticides or other chemicals, or animal cancer viruses raise the risk of leukemia among farm workers.

72-0766. Rasuleva, M. A. (Dept. of Otorhinolaryngology of the Andizhan Medical Inst., Andizhan, USSR.) **K voporsu o deystvii na LOR organy fosfororganicheskikh insektitsidov, primenyaemykh pri obrabotke khlopchatnika. [On the effect of organophosphorus insecticides used in cotton processing on otolaryngological organs.]** *Med. Zh. Uzb. 3: 48-50; 1970.* (Russian)

Effects of mercaptophos (demeton) and methylmercaptophos (demeton methyl) on otolaryngological organs were studied on 21 cases of acute poisoning, and on 14 other workers poisoned 1-2 years earlier. In all cases the poison had been inhaled. The symptoms of acute poisoning were dizziness, headache, nausea, vomiting, and hyperemia of nasal mucosa. Mucous membranes of respiratory organs, and the inner ear were also irritated by organophosphates. In two cases of earlier poisonings subatrophic process was found in the nose, and polyps in three cases. Reduced acuity was revealed in four cases. Vestibular alterations were also found. Chronic poisoning by organophosphorus insecticides may cause considerable disturbances in the inner ear function.

72-0767. Motin, J. (Faculte de Medicine de Lyon, Lyon, France). **Diagnostic et traitement de l' intoxication cyanhydrique. [Diagnosis and treatment of cyanide poisoning.]** *Rev. Lyon. Med. 19(suppl.): 105-107; 1970.* (French)

Hydrocyanic acid and some of its salts act quickly while other salts have a retarded action due to the gradual liberation of the CN group in contact with the gastric juice or the blood. Cyanides cause histotoxic anoxia by inhibiting the cytochrome oxidases of the mitochondrial oxido-reduction chains. Thus, CN shows a high affinity to trivalent iron. Of all tissues, those containing cytochrome oxidase, and sensitive to anoxia (central nervous system), are most sensitive to cyanides. Cyanides are eliminated from the body via the breath and urine in the form of HCN and thiocyanate, cyanocobalamin, CN^- etc. The principal symptoms of acute and subacute poisonings are hyperpnea, nervous troubles, and unconsciousness, while those of chronic poisoning are similar to the symptoms of carbon monoxide poisoning. Treatment consists of the detoxication of the cytochrome oxidases and the neutralization of the CN^- group. Oxygen therapy and administration of substances capable of transforming one part of the hemoglobin into methemoglobin in a proportion below 40% (intravenous injections of methylene blue or sodium nitrite or EDTA Di-Cobaltic, or a combination of hydroxocobalamin and sodium thiosulfate) should be applied. Also the inhalation of amyl nitrite is useful. Cases of varying gravity are described.

72-0768. Gustafsson, J. A.; Lisboa, B. P. (Dept. of Chemistry, Karolinska Inst., Stockholm, Sweden). **Steroids in urine from a patient with adrenocortical carcinoma after treatment with *o,p'*-DDD.** *Steroidologia 2(1): 27-37; 1971.* (36 references)

A patient with adrenocortical carcinoma was treated with *o,p'*-DDD (TDE) and the steroids in the urine were studied by gas chromatography/mass spectrometry. The major part of the steroids identified occurred in the monosulfate and disulfate fractions and some were present in the free steroid fraction. There were no steroids found in the glucuronide fraction. Fourteen steroids were identified, all had a 3β-hydroxy-Δ^5 structure. The stereochemistry of two other 3β-hydroxy-Δ^5 steroids and seven saturated steroids was not established. The saturated steroids were present in much smaller amounts.

72-0769. Delga, J.; Motin, J.; Bouletreau, P.; Rouzioux, J.-M. (Laboratoire de Chimie de l'Hopital Militaire d'Instruction du Val-de-Grace, Paris, France). **Problemes actuels de l'intoxication cyanhydrique. [Actual problems of hydrocyanic acid poisoning.]** *Therapeutique 46(9): 887-892; 1970.* (French)

The high toxicity of hydrocyanic acid (HCN) resides in its readiness to form metallic complexes, and its inhibition of the cytochrome oxidase. Both the mechanism of the poisoning and the therapy are based on the cellular asphyxia. Tissues with very high aerobic activity (nervous tissue, etc.) are most sensitive. Substances showing high affinity to hydrogen cyanide (dioxyacetone, sugars, sulfur, iron and cobalt compounds such as methemoglobin, hydroxocobalamin, sodium thiosulfate, etc.) can be applied in treatment. Also oxygen therapy, EDTA Di-Cobaltic, and the inhalation of amyl nitrite are very useful, particularly in acute and subacute cases. Acute poisoning may cause death within 5-20 minutes. General symptoms of acute and subacute poisonings are hyperpnea, nervous troubles and unconsciousness while chronic cases are similar to poisonings by carbon monoxide. A major part of subacute poisonings occurs in indus-

try. The lethal dose for HCN is about 50 mg when entering the organism perorally, 10 ppm is a dangerous dose when inhaled. Cyanides capable of forming CN^- when contacting the gastric juice or the blood act slower than hydrocyanic acid.

72-0770. Tishkov, A. I.; Saley, P. I.; Vitkalov, V. P. (Veterinary Med. Research Station, Voronezh, USSR). **Otravleniye ptitsy granozanom. [Poultry poisoning with Granosan.]** *Veterinariya 45(4): 58; 1968.* (Russian)

Heavy losses occurred in a poultry-yard due to feed treated with Granosan. The clinical symptoms observed in chickens on the last day before death were depression, spasm, paralysis of the limbs, swollen heads, and body temperatures of 40.3-41°C. Serous edema in the neck region and extremities were found upon autopsy. Mucous edema and hemorrhagic inflamation of the intestine as well as mercury residues in kidneys, livers, to a lesser extent in muscles, skin, brains, lungs, hearts, ovaries, and eggs were ascertained. Depending on the duration and intensity of the exposure, mercuric residues could be detected in tissues as long as 120 days after poisoning.

72-0771. Zhabin, V. A.; Litvishchenko, F. I. (Sixty-Seventh Clinical City Hosp. Moscow, USSR). **Sluchay otravleniya khlorofosom. [A case of chlorophos poisoning.]** *Vrach. Delo 3: 143-144; 1971.* (Russian)

A case of accidental chlorophos (trichlorfon) poisoning is described. The patient (a 32-yr-old woman) lost consciousness for 7 hr to 10 hr following poison intake. Depression and anxiety characterized her psychological condition upon arousal. This condition lasted for 6 days and the patient left the hospital 12 days following the accident with no organic damage. Muscular hypotrophy, focused on the limbs, appeared 26 days after the incident and the patient returned to the hospital upon diagnosis of polyneuritis. Development of polyneuritis following acute poisoning with chlorophos was considered as a result of its direct effect upon the peripheral nervous system.

72-0772. Vatutin, N. T.; Goncharov, V. P.; Malyutina, L. M. (Miners Hosp., Makeyevka, USSR). **Ostroye otravleniye khlorofosom. [Acute poisoning with chlorophos.]** *Vrach. Delo 9: 140-141; 1971.* (Russian)

A 44-yr-old man was accidentally poisoned with chlorophos (trichlorfon). General weakness and dizziness accompanied by vomiting and diarrhea constituted the first symptoms of acute poisoning 10 minutes following intake. The patient lost consciousness on the way to the hospital. Facial and neck muscle spasms developed later and were accompanied by 39°C temperature. A cyanotic condition, total areflexia and a cold, pale, and wet skin constituted the other symptoms. The cardiac tones were mute and the arterial pressure decreased to 90/40 min Hg. Abundant foamy salivation was associated with tongue swelling. The abdomen appeared to be soft upon touch and the liver boundaries reached the rib arch. The patient regained consciousness 3 hr following i.v. administration of preparations including atropine, strophanthin and glucose and s.c. atropine and ephedrine in combination with hydrocortisone and cordiamine. The severe condition of the patient lasted for 6 days. Supportive treatment included hydrocortisone, vitamins B1, B6, B12, and C, penicillin, and neomycin (i.m.) in addition to daily atropine (i.v. and s.c.). The patient was released in satisfactory condition 16 days following the incident.

72-0773. Ohto, K. (Ophthalmic Div., Saku Municipal National Health Insurance, Asama Gen. Hospital, Saku City, Nagano Pref., Japan). **[Diagnosis and treatment of eye disease caused by organophosphorus pesticides.]** *Ganka(Ophthalmol.) 14(1): 17-26; 1972.* (25 references) (Japanese)

Eye disease in children of farming families in Saku district has been attributed by the author to exposure to organophosphorus and carbamate insecticides used in the district for controlling crop pests. The present article describes the general aspects of the disease in three cases of children and one case of an adult. The main symptoms in children are: disturbance of vision, peripheral stricture of visual field, abnormal refraction, disturbance of eye-ball motion and pupilla, lesion of optic nerve and general neurosis with depression of serum cholinesterase activity. Adults claim mainly disturbances in the autonomic nervous system, neurosis of optic nerve, disturbance of eye-ball motion and pupilla with marked depression of serum cholinesterase activity. In some groups of patients *p*-nitrophenol was found in their urine at a concentration of 32.8 mg/ml as compared to 1.75 mg/ml of healthy persons on the average. Although the symptoms in adults are lighter than in children, depression of hepatic function and abnormalities in fasciculus ventralis and fasciculus dorsalis, autonomic nervous system and muscular system were observed. Priphynium bromide restored the visual acuity and injections of PAM were also effective.

See also 72-0666 72-0670 72-0673 72-0676 72-0682 72-0683 72-0686 72-0687 72-0695 72-0700 72-0703 72-0710 72-0725 72-0792 72-0793 72-0807 72-0820 72-0823

72-0774. Lechner, M. C.; Pousada, C. R. (Laboratorio de Farmacologia, Centro de Biologia, Instituto Gulbenkian de Ciencia, Oeiras, Portugal). **A possible role of liver microsomal alkaline ribonuclease in the stimulation of oxidative drug metabolism of phenobarbital, chlordane and chlorophenothane (DDT).** *Biochem. Pharmacol. 20(11): 3021-3028; 1971.* (33 references)

During administration of phenobarbital at 80 mg/kg body weight/day to rats, liver RNase activity was significantly reduced 12 hr after initiation of treatment, reaching a reduction plateau at 48 hours. The activity of this enzyme rose sharply after suspension of the treatment on the 10th day. The increases noted in cytochrome P-450, aminopyrine oxidative demethylase, aniline hydroxylase and liver weight developed more slowly, and also regressed more slowly upon cessation of treatment. Following a single dose of 100 mg chlordane or 100 mg DDT, greatly reduced liver microsomal RNase activities were found within 10 hours, accompanied by slower rises in the other factors tested. These results lend support to the suggested role of increased RNA accumulation in the enhancement of mixed-function oxidase activity following drug administration.

72-0775. Mayer, O.; Michalek, H. (Dept. of Therapeutical Chemistry, Instituto Superiore di Sanita, Rome, Italy). **Effects of DFP and obidoxime on brain acetylcholine levels and on brain and peripheral cholinesterases.** *Biochem. Pharmacol. 20(11): 3029-3037; 1971.* (23 references)

Administration of the cholinesterase (ChE) reactivator obidoxime in rats either before and after DFP administration (reactivator, 12.5 mg/kg i.p.; DFP, 1.5 mg/kg s.c.) or in a single dose of 25 mg/kg just after DFP failed to raise the brain ChE activity in comparison to DFP-treated animals alone, but did prevent the rise in rat brain ACh activity observed 90 minutes after DFP administration. At later time points (3 and 16 hours), the brain acetylcholine levels in DFP and DFP-obidoxime treated animals were similar to those in the controls. Obidoxime brought about complete ChE reactivation in erythrocytes and partial reactivation in serum, but did not alter the effects of DFP in liver, kidney or diaphragm. Comparisons with results of other authors reveal that differences in experimental methodology have a drastic effect on the results.

72-0776. Spalding, J. W.; Ford, E.; Lane, D.; Blois, M. (Cell Biology Branch, National Institute of Environmental Health Sciences, Res. Triangle Park, NC 27709). **The character of 1,1,1-trichloro-2,2-bis-(*p*-chlorophenyl) ethane resistance in mouse L 5178 Y lymphoma cells.** *Biochem. Pharmacol. 20(11): 3185-3196; 1971.* (29 references)

Chronic sublethal treatment of mouse L 5178 Y leukemic cells with 1×10^{-5} *M* of DDT per day for 3 weeks resulted in the development of a cell population which was resistant to DDT, as demonstrated by its ability to attain 100% cloning efficiency at a DDT concentration (20 μg/ml) lethal for 100% of untreated cells. The resistant cells also displayed resistance to Kelthane (dicofol), DDD, methoxychlor, DDE, and DDA. A clone selected from the resistant cells and carried without DDT through 360 replications still exhibited the same degree of resistance which it originally had upon cloning. Incubation of resistant clones with tritium-labeled DDT was not followed by recovery of any DDT metabolites, so that the resistance mechanism in cell culture must be attributable to some mechanism other than the detoxification by metabolization presumed to occur in higher organisms.

72-0777. Bajgar, J.; Jakl, A.; Hrdina, V. (Purkyne Medical Res. Inst., Hradec Kralove, Czechoslovakia). **Influence of trimedoxime and atropine on acetylcholinesterase activity in some parts of the brain of mice poisoned by isopropylmethyl phosphonofluoridate.** *Biochem. Pharmacol. 20(11): 3230-3233; 1971.* (20 references)

Acetylcholinesterase activity was determined in homogenates of four parts of the brains (pons with medulla oblongata, mesencephalon, diencephalon and basal ganglia) of mice poisoned with isopropylmethyl phosphonofluoridate (IMPF, sarin) and treated with atropine and varying amounts of the cholinesterase reactivator, trimedoxime bromide. Poisoned mice received 0.2 or 0.4 mg/kg IMPF; treated mice, 0.4 mg/kg IMPF, followed 30 sec later by 21 mg/kg atropine sulfate and 2.06, 4.63, 10.4, 15.6, 23.3, 35.0, 52.5, or 79.0 mg/kg of trimedoxime bromide. The animals were killed 2 hr later, and brain section homogenates prepared. AChE activity remaining in the brains of poisoned animals was highest in the basal ganglia and lowest in the pontomedullar part. An increase in AChE activity in treated groups was noted only in the pontomedullar part (from 3 to 15% of activity compared to normal controls); AChE activity in this area was correlated inversely with mortality. Thus it appears that a very slight increase in AChE activity in the pontomedullary part of the brain alone was sufficient to ensure survival of treated mice. An increase of this magnitude would not be observed if whole brain homogenates were studied.

72-0778. Koch, R. B.; Cutkomp, L. K.; Yap, H. H. (Life Sciences, Honeywell Res. Center, Hopkins, MN 55343). **Inhibition of oligomycin senstitive and insensitive fish adenosine triphosphatase activity by chlorinated hydrocarbon insecticides.** *Biochem. Pharmacol. 20(11): 3243-3245; 1971.* (7 references)

Different types of chlorinated hydrocarbon insecticides were found to differ in specificity for different types of Mg^{2+} ATPase, as demonstrated by inhibition of oligomycin-sensitive and oligomycin-insensitive Mg^{2+} ATPase activities. Oligomycin inhibition of Mg^{2+} and

Na^+-K^+ ATPase varies greatly among the bluegill sunfish tissues tested; the fish brain preparation was selected for studying insecticide inhibitions. The mitochondrial (oligomycin-sensitive) Mg^{2+} ATPase was almost totally inhibited by DDT and DDE, whereas the non-mitochondrial (oligomycin-insensitive) Mg^{2+} ATPase was only one-fourth as sensitive to these two insecticides. Aldrin was the least effective inhibitor of total Mg^{2+} ATPase activity, but in contrast to the other insecticides tested, its greatest effect was on the non-mitochondrial Mg^{2+} ATPase. The inhibition of total Mg^{2+} ATPase activity by chlordane was approximately equal to that of DDT; however, it was comparatively more active against the non-mitochondrial fraction. The differences observed may pertain to the mode of action of these insecticides.

72-0779. Lindquist, N. G.; Ullberg, S. (Dept. of Toxicology, U. of Uppsala, S-751 05 Uppsala, Sweden). **Distribution of the herbicides 2,4,5-T and 2,4-D in pregnant mice. Accumulation in yolk sac epithelium.** *Experientia 27(12): 1439-1441; 1971.* (12 references)

Radiolabeled 2,4,5-T and 2,4-D were administered to mice at various stages of pregnancy, and the localization of radioactivity determined by whole-body autoradiography after various time intervals. When radiolabeled 2,4,5-T was injected into mice on the 8th and 9th days of pregnancy, radioactive material was not found in the embryo to an appreciable extent. The only organs with higher concentrations than the blood were the kidneys and the visceral yolk sac epithelium; similar findings were obtained when 2,4,5-T was injected in the late stage of pregnancy. With increasing time between injection and sacrifice of the animals, increasing concentration in the yolk sac and disappearance from other tissues was noted. The radioactivity slowly passed the placenta, but accumulation in specific fetal tissues did not occur. Labeled 2,4-D showed a slight tendency to accumulate in the visceral yolk sac and pass to the fetus, but was rapidly (within 24 hr) eliminated from all tissues. The selective uptake of 2,4,5-T in the yolk sac epithelium and the lack of placental transfer in early pregnancy suggest a mode of teratogenic activity similar to that of trypan blue, which has been postulated to act by enzymatic inhibition of embryotrophic nutrition.

72-0780. Shea, K. P. (Author address not given). **Captan and folpet.** *Environment 14(1): 22-24, 29-32; 1972.* (18 references)

Captan and folpet are two widely used agricultural fungicides of the phthalimide class, for which relatively high tolerances on harvested food crops have been permitted. However, the 1969 report of the Secretary of Health, Education and Welfare's Commission on Pesticides and their Relationship to Environmental Health listed these among nine pesticides which are capable of causing developmental anomalies in laboratory animals. So far, their use has not been restricted, and the collection of further data to determine their teratogenic potential has proven extremely difficult. An obvious relationship to thalidomide, an infamous teratogenic compound, exists in the phthalimide moiety of the molecules, which captan and folpet also share with difolatan, another fungicide. In experimental configurations in which thalidomide produced high numbers of fetal malformations, the only effect of folpet and captan was generally a decrease in the litter size due to fetal resorption. Malformations were observed in the offspring of rabbits and mice treated with captan and folpet, and in developing chicken eggs treated with captan, folpet and difolatan in some experiments. It is conceivable that high fetal resorption rates masked the appearance of malformations in some experiments. Methods of evaluating potential teratogenicity urgently require further investigation.

72-0781. Brown, V. K. H.; Muir, C. M. C. (Shell Research Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Some factors affecting the acute toxicity of pesticides to mammals when absorbed through skin and eyes.** *Int. Pest Contr. 13(4): 16,18-21; 1971.* (48 references)

On the basis of literature data and their own experimental findings, the authors discuss the significance of the percutaneous absorption route in systemic pesticide intoxication. Problems in the assessment of percutaneous toxicity of substances intended for use in man are numerous, including not only the basic problem of extrapolation from one species to another, but also the large number of methodological factors which can quantitatively affect the results, such as coverage of the application site with the stress to the animal which this entails, exposure time, and solvent and concentration effects. The relationships between percutaneous and oral toxicity values are complex, and the reported differences in these values in the literature have in some cases been due to the employment of faulty techniques, such as the use of different vehicles for the two administration routes.

72-0782. Ballard, K. J.; Jones, V. J. (Inst. of Physiology, U. of Glasgow, Glasgow, W.2, Scotland). **The fine structural localization of cholinesterases in the carotid body of the cat.** *J. Physiol. 219(3): 747-753; 1971.* (33 references)

The electron microscope has been used to obtain a clearer picture of the localization of cholinesterase in the carotid body of the cat. The importance of this lies in the possibility of acetylcholine as a transmitter in the carotid body. Schradan was used to inhibit butylcholinesterase and neostigmine to totally inhibit cholinesterase activity.

72-0783. Al-Hachim, G. M. (Pharmacology Dept., Coll. of Medicine, Baghdad, Iraq). **Effect of aldrin on the condition avoidance response and electroshock seizure threshold of offspring from aldrin-treated mother.** *Psychopharmacologia 21(4): 370-373; 1971.* (7 references)

Aldrin enters the human body via many routes; its effects on prenatal development are unknown. To study further the effects of prenatal aldrin administration on the nervous system, aldrin was administered orally to pregnant mice for 7 days in the last third of their pregnancies, at 2 or 4 mg/kg body weight. When the offspring were 30 days old, conditioned avoidance response testing was begun and continued for 7 days; the electroshock seizure threshold was measured on the 38th day. The offspring were also weighed. Statistical analysis of the results revealed no differences in the conditioned avoidance response between offspring from treated and untreated mothers. However, the electroshock seizure threshold was significantly higher in the offspring of treated mothers, and the body weight significantly lower. The results were not dose-dependent.

72-0784. Bollag, J. M.; Alexander, M. (Dept. of Agronomy, Cornell U., Ithaca, NY). **Bacterial dehalogenation of chlorinated aliphatic acids.** *Soil Biol. Biochem. 3(2): 91-96; 1971.* (14 references)

A bacterium capable of utilizing 3-chloropropionic acid (3-CPA) as a sole carbon source was isolated from soil by enrichment culture in a medium containing 3-CPA or 3-chlorobutyric acid, and identified as a strain of *Micrococcus denitrificans*. The enzyme preparation isolated from this bacterium removed the chlorine present in the β-position on several 3- and 4-carbon alkanoic acids, but not a chlorine present in the α-position. Even unsaturated compounds such as crotonic or acrylic acid were dehalogenated; however, 2,2,3-trichloropropionic acid was not. Studies of metabolization of radiolabeled 3-CPA apparently revealed formation of acrylic acid, suggesting that acrylic acid, and not 3-hydroxypropionic acid, is the intermediate formed upon degradation, and that the chlorine is removed by dehydrohalogenation. The stimulatory effect of NADP may be related to its role in this reaction.

72-0785. Kolmodin-Hedman, B.; Alexanderson, B.; Sjokvist, F. (Div. of Occupational Medicine, National Inst. of Occupational Health, Karolinska Institutet, Stockholm 60, Sweden). **Effect of exposure to lindane on drug metabolism: decreased hexobarbital sleeping-times and increased antipyrine disappearance rate in rats.** *Toxicol. Appl. Pharmacol. 20(3): 299-307; 1971.* (21 references)

The effect of lindane was tested in rats on hexobarbital sleeping-times and elimination rate of antipyrine in the isolated perfused liver. Pretreatment with lindane shortened the hexobarbital (100 mg/kg ip) sleeping-times both when given as single ip doses and in chronic feeding tests. The lowest effective doses were 15 mg/kg ip and 0.5 ppm of lindane in the feed. The disappearance rate of antipyrine increased in perfused liver from rats treated 4 days previously with a high single dose of lindane (60 mg/kg ip). It is suggested that pretreatment of rats with lindane resulted in an increased metabolism of hexobarbital and antipyrine in the liver. (Author abstract by permission)

72-0786. Chadwick, R. W.; Cranmer, M.F.; Peoples, A. J. (Pharmacology Section, Perrine Primate Res. Branch, Environmental Protection Agency, P.O. Box 490, Perrine, FL 33157). **Metabolic alterations in the squirrel monkey induced by DDT administration and ascorbic acid deficiency.** *Toxicol. Appl. Pharmacol. 20(3): 308-318; 1971.* (30 references)

A daily oral injection of 5 mg of 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane (DDT) given to squirrel monkeys for a 2-wk period produces significant increases in liver weight, microsomal protein, cytochrome P-450 and the *in vitro* activity of various drug metabolizing enzymes. DDT treatment also significantly alters elimination and storage of radioactivity from ^{14}C-γ-hexachlorocyclohexane (lindane) but not from ^{36}Cl-DDT. However, the results indicate that ascorbic acid deficiency may significantly impair both the induction of *O*-demethylase and the stimulation of the glucuronic acid system by DDT. The D-glucuronic/D-glucaric acid excretion ratio is significantly depressed within 2 days in monkeys fed the ascorbic acid deficient diet. In addition to ascorbic acid deficiency an unknown nutritional factor from the administration of a second lot of the ascorbic acid deficient diet also appears to cause an inhibition of the D-glucuronic/D-glucaric acid excretion ratio. This study provides evidence that interactions between nutritional status and toxic stress may significantly affect some routes of detoxification in the squirrel monkey. (Author abstract by permission)

72-0787. Courtney, C. D.; Moore, J. A. (Natl. Inst. Environmental Health Sciences, P. O. Box 12233, Res. Triangle Park, NC 22709). **Teratology studies with 2,4,5-trichlorophenoxyacetic acid and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *(Toxicol. Appl. Pharmacol. 20(3): 396-403; 1971.* (11 references)

The herbicide 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) were teratogenic in the CD-1, DBA/2J, and C57B1/6J strains of mice. Both compounds produced cleft palates and kidney malformations. When these compounds were administered in combination, the activity was not potentiated at the doses employed. In the CD rat, 2,4,5-T was neither teratogenic nor fetotoxic. However, TCDD produced kidney anomalies. Prenatal administration of 2,4,5-T did not affect the postnatal

growth and development of the CD rat. (Author abstract by permission)

72-0788. FDA Advisory Committee on Protocols for Safety Evaluation (Bureau of Science, Food and Drug Administration, Washington, D.C. 20204). **Food and Drug Administration Advisory Committee on protocols for safety evaluation: Panel on carcinogenesis report on cancer testing in the safety evaluation of food additives and pesticides.** *Toxicol. Appl. Pharmacol. 20(3): 419-438; 1971.* (39 references)

The advisory committee has primarily devoted this report to answering some questions which have arisen in the testing of various substances for carcinogenicity, and to discussion of specific suggestions for updating the test procedures. These suggestions remain the same whether the substance under investigation is a food additive, a pesticide, or any other material. Of particular relevance from the pesticides viewpoint are the statement that the carcinogenesis question needs further intensive study, and the recommendation that the investigator prepare for his test animals a semi-synthetic diet composed of purified components, in order to exclude the possibility of dietary contamination with pesticides or other potential carcinogens. Contamination of contact surfaces in animal quarters is also to be avoided. Sixteen broad recommendations for carcinogenesis testing procedure are presented. The committee also recommends that the FDA require that food additives and pesticides be evaluated for carcinogenicity. Statistical evaluation of test results requires particular attention.

72-0789. Meiniel, R.; Lutz-Ostertag, Y.; Lutz, H. (Laboratoire de Biologie animale, Universite de Clermont-Ferrand, B.P. 45, 63-Aubiere, France). **Intoxication aigue de l'embryon de poulet au parathion. Effets sur le glycogene hepatique et les catecholamines surrenaliennes. [Acute intoxication of the chick embryo by parathion. Effects on hepatic glycogen and adrenal catecholamines.]** *Arch. Anat. Microsc. Morphol. Exp. 66(3): 235-248; 1971.* (25 references) (French)

On the 16th day of incubation, the allantois of chick embryos were injected with acute doses of parathion and the eggs opened on the second day of development. Controls were injected with 0.05 ml of olive oil and the albumin was extracted; this process did not cause significant variations of the hepatic glycogen and adrenal catecholamine level. Injection of 5 mg of parathion with the 0.05 ml of oil caused a significant depletion of the hepatic glycogen after 5 hr.; there was also a significant decrease of the amount of catecholamines in the adrenals.

72-0790. Natoff, I. L. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Influence of the route of exposure on the acute toxicity of cholinesterase inhibitors.** *Arh. Hig. Rada Toksikol. 21(4): 347-352; 1970.* (11 references)

Acute toxicities of ten cholinesterase inhibitors were determined using oral, intraperitoneal, subcutaneous, intravenous, and intracerebral routes of injection in female mice. The estimated lethal dose of neostigmine, eserine, monocrotophos, dicrotophos, mevinphos, crotoxyphos, dichlorvos, chlorfenvinphos, paraoxon, and parathion are tabulated for hepatic, peripheral, intracerebral routes. It was concluded that there is an agreement between the route of exposure of cholinesterase inhibitors to mice and the known metabolism of these compounds. It was shown that the order of toxicity of these compounds follows a similar trend irrespective of the route of exposure. The use of various routes of administration in preliminary acute toxicity studies is therefore valuable in obtaining an indication of the fate of biologically active compounds in the body. Cholinesterase inhibitors have been used only as an example in this work. The principle illustrated applies to all biologically active materials.

72-0791. Abe, E. (Japan Inst. of Rural Medicine, Usada-Machi, Nagano Pref., Japan). **[Chronic toxicity test of phenylmercuric acetate on rhesus monkey *(Macaca mulatta)*.]** *Baioteku (Biotech) 3(2): 98-104; 1972.* (6 references) (Japanese)

Four groups of rhesus monkeys, age 2 to 3.5 years, consisting of two males and two females, were fed diets containing phenylmercuric acetate (PMA) at the rate of 50, 10, 2 and 0.4 ppm for 48 mo. Dosage levels used were 1.25, 0.25, 0.05 and 0.01 mg PMA/kg/day. Another group was used for control. The criteria of effect included mortality, body-weight change, diet consumption, micropathology, organ-weights, measurements of blood, urine and biochemical parameters and serum antibody formation. Contents of mercury in liver, kidney and brain were measured by dithizon method. None of the criteria measured was significantly altered at any dose level except: infiltration of round cells in Glisson's capsule of liver found in the 50 and 0.4 ppm groups, antibody formation in serum (passive cutaneous anaphylaxis reaction) in all the tested groups and abnormal proliferation of lymph follicles in kidney in the 2.0 ppm group. Mercury content in brain, liver and kidney was significantly higher in the tested groups than in control, and especially in kidney the content ran parallel to the dosage level, the value in the 50 ppm group being 2.07 ppm in brain, 22.85 ppm in liver and 173.8 ppm in kidney. The abnormal proliferations in the kidney could be possibly explained as an allergic phenomenon attributable to PMA because PMA was found to be an antigen. Therefore, it will be necessary to examine the possibility of the occurrence of other allergic disturbances due to PMA, as well as the fate and metabolism of PMA in the animal body in connection with the possibility of formation of methyl mercury *in vivo*.

72-0792. Matsushima, S. (Japan Inst. of Rural Medicine, Usada-Machi, Nagano Pref., Japan). **[On the toxicity of organophosphorus pesticides.]** *Baioteku (Biotech) 3(2): 105-110; 1972.* (17 references) (Japanese)

Organophosphorus chemicals and organochlorine compounds have been extensively utilized for insect control since World War II. Due to their persistency and accumulation in the environment, DDT and BHC have been recently banned in several countries. The author describes the mechanisms of their poisoning with special interest relating to their anti-acetylcholine function at acetylcholine-receptor, their possible breaking of lysosome and their inhibitory function against carboxylases and phosphatases. He points out that there are fewer reports on chronic toxicity of organophosphates as compared to acute toxicity, and refers to some published reports on chronic toxicity of EPN, malathion, and fenitrothion in order to emphasize the necessity of investigating the possible neurological change in vertebrates due to organophosphorus exposure.

72-0793. Ichikawa, H. (Saku General Hosp., Saku, Japan). **[Pathology of BHC poisoning.]** *Baioteku (Biotech), 3(2): 111-116; 1972.* (14 references) (Japanese)

When maximum of 10.0 ppm, minimum of 1.2 ppm of γ-BHC were detected in the "smelly rice" sent for examination by the peasants of the area in 1967, a 12-week experiment was conducted on rabbits. Three groups of test rabbits were given 3.75 mg/kg, 7.50 mg/kg, and 15.00 mg/kg of γ-BHC respectively. At six weeks and 12 weeks after administration, autopsies were conducted, and histological examinations were given. The physical growth was clearly impaired in the large dosage group, although little change was noted from the control group in the minimum and medium dosage groups. No nervous symptoms were recognized in any group. Hematological examination showed no pattern. A/G ratio generally decreased, including the control group, but the degree was greatest in the maximum dosage group. GPT and nitrogen in urine tended to increase in the maximum dosage group. The livers of the large dosage group were swollen, disfigured, and hyperemic. The liver and suprarenal glands tended to be larger in the medium and large dosage groups. Histologically, liver cells were swollen and appeared to resemble acute xanthoatrophy of liver. Vicarious hypertrophy was noted in the remaining cells of the liver. The spleens of the large dosage group were expanded and congested, fibrotic and follicular atrophy had appeared. The brains of the large dosage group were severely affected by increased neuronophagia and gliophagia.

72-0794. Owen, W. J.; Rogers, L. J. (Dept. of Biochemistry and Agricultural Biochemistry, U. Coll. of Wales, Aberystwyth, Cards. SY23 3 DD, U.K..). **Inhibition of photosynthetic electron transport by 1,1,1-trichloro-2,2-bis-(*p*-chlorophenyl)ethane (DDT) at a site in the intermediate electron-transport chain.** *Biochem. J. 125(2): 43P-44P; 1971.* (5 references)

DDT was previously reported to inhibit photosynthetic electron transport at a site before photosystem 2; however, the possibility of inhibition at an additional site was also postulated. The second site was identified from studies of electron donation to photosystem 1 in the oxygen electrode, using paraquat or diquat as the electron acceptor from photosystem 1, and 2,6-dichlorophenol-indophenol-ascorbate, *N,N,N',N'*-tetramethyl-*p*-phenylenediamine-ascorbate or 2,3,5,6-tetramethyl-*p*-phenylenediamine-ascorbate couples as the electron donors. Electron donation in the case of the first system was found to be the same in untreated barley chloroplasts as in sensitive barley chloroplasts treated with DDT three days earlier, thus at 50% inhibition of Hill activity; electron transport was significantly reduced in the case of the second and third systems. However, when chloroplasts were treated with DDT after isolation, no electron transport inhibition was demonstrated in any of the three systems, although Hill activity was inhibited by 45%.

72-0795. Cornish, H. H. (Dept. of Environmental and Industrial Health, School of Public Health, U. of Michigan, Ann Arbor, MI). **Problems posed by observations of serum enzyme changes in toxicology.** *Crit. Rev. Toxicol. 1: 1-32; 1971.* (187 references)

This review, focusing on the utilization of serum enzyme determinations as a toxicological tool in the detection and localization of physiological changes in response to chemical insults, is divided into three main sections. The first, dealing with the relationships between serum and tissue enzymes, indicates that whereas extensive data have been gathered on the reflection of liver enzyme changes in the serum, much remains to be done in the utilization of heart, lung and kidney enzyme values. The second section sketches the potential utility of serum isoenzyme pattern analysis in detecting early toxic response and determining the target organ of a given chemical insult without necessitating animal sacrifice. The third section discusses the relationships between plasma, red cell, and brain cholinesterase and the comparability of cholinesterase data from various sources. Reporting of cholinesterase activity in terms of micromoles of substrate hydrolyzed per ml per minute will aid in comparison of data for various cholinesterase-inhibiting compounds, organisms and experimental conditions. In assessing human exposure to cholinesterase inhibitors, comparison of individual values with pre-exposure controls is more satisfactory than comparison with a population average; however, the use of 20-30% cholinesterase inhibition compared to the population average as an indication of anticholinesterase exposure has provided reasonable safety.

72-0796. Ryan, A. J. (Dept. of Pharmacy, U. of Sydney, Sydney, Australia). **The metabolism of pesticidal carbamates.** *Crit. Rev. Toxicol. 1: 33-54; 1971.* (79 references)

Carbamates, as well as other xenobiotic materials, undergo a limited number of metabolic reactions *in vivo*. These reactions fall into the categories of oxidation, reduction, hydrolysis and conjugation. Many carbamates undergo oxidation reactions in the form of aromatic hydroxylation, aliphatic hydroxylation, *N*-dealkylation or *O*- and *S*-dealkylation, and sulfoxidation. Although hydrolysis was previously assumed to be an important metabolic reaction of carbamates, it has now been found that the rate of hydrolysis varies widely among compounds and species, and that the resistance of carbamates to hydrolysis *in vivo* is responsible for the formation of oxidized metabolites. Important conjugation reactions of carbamates and their metabolites include formation of sulfates, glucuronides, and mercapturic acids. Conjugate formation during carbamate metabolism has not been studied completely, and available data are conflicting. Work by the author on the metabolism of carbaryl in the rat demonstrates that thioether conjugates are formed during carbaryl metabolism, possibly via an epoxide intermediate. Comparative studies on carbaryl metabolism in various animal species are just getting underway. The suggested significance of an epoxide intermediate may offer insight into the origin of chronic toxic effects via binding to macromolecules; extremely detailed metabolic studies will be required to provide understanding of relationships between metabolism and toxicity.

72-0797. Schwetz, B. A.; Sparschu, G. L.; Gehring, P. J. (Chemical Biology Research, The Dow Chemical Co., Midland, MI 48640). **The effect of 2,4-dichlorophenyoxyacetic acid (2,4-D) and esters of 2,4-D on rat embryonal, foetal and neonatal growth and development.** *Food Cosmet. Toxicol. 9(6): 801-807; 1971.* (12 references)

Doses of 12.5-87.5 mg/kg body weight/day of 2,4-D or molar equivalents of its propylene glycol butylene ether ester (PGBE) and isooctyl ester (IO) were administered to groups of female rats from the 6th to 15th days of gestation; half the dams were killed and the fetuses examined on the 20th day. PGBE and IO were administered to other rat groups on days 5-8 to evaluate their effects on implantation, and IO on days 8-11 or 12-15 to detect effects on early and late organogenesis. The remaining dams in each treatment group were allowed to deliver naturally and the offspring observed for 3 weeks after parturition. Standard statistical comparisons of the control populations and litters with the populations and litters in the various experimental groups (about 15 rats each) using the standard χ^2 test, Barlett's test, *t*-test, and sign test, all at the 5% probability level, were unable to either compensate for or indicate the significance of the large number of anomalous findings which appeared inconsistently in various groups. The only developmental anomalies which consistently accompanied treatment with higher levels of the test substances were decreased fetal body weight, subcutaneous edema, delayed ossification and rib malformations. Since these anomalies did not interfere with fetal or neonatal development or survival, they are regarded as embryotoxic or fetotoxic rather than teratogenic effects. Delayed ossification prior to delivery was not correlated with continued defective ossification or other residual effects in the 3-week-old neonates, and thus may represent merely a transient retardation of growth. The apparent order of intensity for effects on fetal development is IO > 2,4-D acid > PGBE.

72-0798. Earl, F. L.; Curtis, J. M.; Bernstein, H. N.; Smalley, H. E. (Special Pharmacological Animal Lab., Div. of Toxicology, Bureau of Foods, Food and Drug Administration, Department of Health, Education & Welfare, Washington, DC 20204). **Ocular effects in dogs and pigs treated with dichloran (2,6-dichloro-4-nitroaniline).** *Food Cosmet. Toxicol. 9(6): 819-828; 1971.* (14 references)

Previous studies revealed that administration of dichloran to dogs produces corneal opacities only in those dogs which are subsequently exposed to light (see Abstract No. 71-0985). In this study, dichloran was fed to dogs and miniature swine at 0.75, 6.0, 24, 48, or 192 mg/kg/day for 50-306 days. The dogs receiving 192 mg/kg/day died after 49-53 days. Corneal opacities, detectable by slit lamp examination, appeared in the eyes of dogs treated at the 24 and 48 mg levels and housed outdoors. Opacities did not develop in eyes of dogs treated at these levels if the dogs were housed in the dark or the eyelids sutured shut. The pigs failed to display either toxic manifestations or eye damage. A dose-dependent trend was noted for the eye damage in dogs. Histological examination of damaged corneas revealed the presence of small, light-to-dark orange droplets of an unidentified substance associated with superficial corneal stromal cell nuclei. An orange discoloration of the urine of the treated dogs was observed. Heinz bodies in the red cells and elevated reticulocyte counts were found in some dogs and swine at the higher dosage levels. The ocular lesions remained unchanged after dichloran administration was stopped. Direct application of dichloran dust or 5% solution to the eyes of dogs for 3 months had no effect on the cornea or conjunctiva.

72-0799. Matsumura, A. (Dept. of Public Health, School of Medicine, Hokkaido U., Sapporo, Japan). **The relationship between chemical structures of chlorophenols and their biological activities.** *Sangyo-Igaku (Jap. J. Ind. Health) 14(1): 30-31; 1972.* (6 references)

The author chose three di-, two tri-, one tetra-, and one pentachlorophenol as material and studied the relationship between chemical structures and their effects on oxidative phosphorylation in rat liver mitochondria.

The effects were studied by a manometric method; ATP-ase activity of intact mitochondria being estimated by net release of phosphate from ATP; dissociation constants for chlorophenols being measured by comparison of absorption spectra in solutions of different pH or by potentiometric titration. It was found that all compounds were potent uncouplers for oxidative phosphorylation because of their dissociation of respiration of mitochondria from inorganic phosphate uptake and their activation of latent ATPase of freshly prepared mitochondria. As the number of substituted chlorine atoms in the benzene ring is increased, the impairment of oxidative phosphorylation is augmented. The addition of a chlorine atom seemed to decrease the dissociation constant, pK; however, the definite pK was dependent on the position of the substituent. Chlorophenols were grouped into two classes according to their equi-effective concentrations and pK values. Within each group there is an inverse linear relationship between equi-effective concentration and pK value. It seems probable that the anion produced by ionization of 2,6-positions cannot react with some intermediates of phosphorylation mechanisms by virtue of the steric or electronic interference by the *ortho*-chlorine atom.

72-0800. Schulte Hermann, R.; Koransky, W.; Leberl, C.; Noack, G. (Institut fuer Toxikologie und Pharmakologie der Philipps-Universitaet Marburg, Marburg a.d. Lahn, Pilgrimstein 2, Germany). **Hyperplasia and hypertrophy of rat liver induced by α-hexachlorocyclohexane and butylhydroxytoluene. Retention of the hyperplasia during involution of the enlarged organ.** *Virchows Arch. B 9(2): 125-134; 1971.* (36 references)

The liver mass increases in animals treated with α-hexachlorocyclohexane (α-BHC) or butylhydroxytoluene (BHT) due to both hyperplastic and hypertrophic changes. Various cell parameters were examined during the involution phase in rats with enlarged livers produced by these substances, to determine whether uniform regression of hypertrophy and hyperplasia occurs. Liver samples from rats treated with 200 or 400 mg α-BHC (1 and 2 doses respectively) or 500 mg/kg/day BHT for 11 days were examined for DNA content, number and size of liver cell nuclei, and number and size of hepatocytes. Whereas liver weight returned to normal within 2 weeks of the maximum drug effect, the elevated DNA contents, number of liver cell nuclei and percentage of tetraploid nuclei remained relatively constant over the 7-week posttreatment period. The mean volume of the hepatocytes remained below that of the controls during this time as well. Thus liver hyperplasia following drug-induced liver enlargement is not rapidly reversible.

72-0801. Lullman, H.; Ohnesorge, F. K.; Tonner, H. D.; Wassermann, O,; Ziegler, A. (Dept. of Pharmacology, Christian-Albrechts-U., Kiel, W. Germany). **Influence of alkane-bis-onium compounds upon the activity of the AChE and upon its inhibition by DFP.** *Biochem. Pharmacol. 20(10): 2579-2586; 1971.* (17 references)

Some alkane-bis-onium-derivatives display a dual action on acetylcholinesterases: They are reversible inhibitors and delay the irreversible inhibition by DFP. The kinetic analysis of the inhibitory action of the compounds revealed a competitive, a non-competitive or a mixed type of mechanism depending upon the chemical structure. Derivatives with larger substituents act mainly or entirely non-competitively as shown by their α-values. Calculations of the binding energy indicate that all C-atoms of the interionic chain as well as of the substituents at the N-atoms add to the binding via hydrophobic and van der Waal's forces. The non-competitive acting alkane-bis-onium compounds have to be bound to anionic site receptors and adjacent surface areas. An interference with the primary substrate binding does not occur. The acylation, however, of the esteratic site becomes impaired, thus leading to an inhibition of the enzymatic activity as well as retardation of the phosphorylation by DFP. (Author abstract by permission)

72-0802. Harris, L. W.; Yamamura, H. I.; Fleisher, J. H. (Basic Medical Sciences Dept., Medical Research Lab., Edgewood Arsenal, MD). ***De novo* synthesis of acetylcholinesterase in guinea pig retina after inhibition by pinacolyl methyl phosphonofluoridate.** *Biochem. Pharmacol. 20(10): 2927-2930; 1971.* (20 references)

Dephosphorylation represents the mode of action in the detoxification by oximes of acetylcholinesterases poisoned with certain organophosphorus insecticides. "Aging" of poisoned enzymes blocks dephosphorylation and thus prevents reactivation; the rate of aging differs in acetylcholinesterases inhibited by various organophosphates. Aging occurs very rapidly in the case of soman poisoning: in soman-inhibited guinea pig retinal AChE *in vitro*, the aging half-time is 6.2 ± 0.7 min. Therefore, the observed recovery of AChE activity in guinea pig retinas after soman intoxication within 24 hours might be due to *de novo* synthesis of AChE. This hypothesis was confirmed by the fact that simultaneous administration of cyclophosphamide, an inhibitor of protein synthesis, with soman and atropine in guinea pigs reduced both the survival percentage and the percent recovery of retinal AChE activity to a high degree. If sarin was used as the anticholinesterase, the survival and AChE recovery were impaired only slightly by the additional administration of cycloheximide, thus confirming the importance of the alternative detoxification mechanism, i.e., dephosphorylation, in the case of this compound, in addition to *de novo* acetylcholinesterase synthesis.

72-0803. Lauwerys, R.; Buchet, J. P. (Industrial Toxicology Unit, Catholic U. of Louvain, Brussels, Belgium). **Studies on the mechanism of toxicity of the organophosphorus pesticide triamiphos.** *Eur. J. Pharmacol. 16(3): 361-366; 1971.* (8 references)

The mechanism of the acute toxic effect of triamiphos (5-amino-(bis)dimethylamido)phosphoryl-3-phenyl-1,2,4-triazole) in rats was investigated, using the customary methodology. The acute LD50 by the i.p. route is about 15 mg/kg; clinical manifestations always develop within 15 min after the injection, and consist of typical signs of peripheral cholinesterase inhibition. The animals in which death by respiratory failure does not occur within 25 minutes invariably survive. Animals receiving lethal doses could be maintained by repeated administration of atropine. The greater depression of pseudocholinesterase than true cholinesterase measured 3 hr after i.p. injection of triamiphos is in agreement with the primarily peripheral effect. No significant return of cholinesterase activity *in vivo* was observed within 18 hours except in the case of the intestine. *In vitro* tests revealed that the actual cholinesterase inhibitor is not triamiphos itself, but a metabolite produced by the liver. The active metabolite is very labile and does not cross the blood-brain barrier. The findings indicate that plasma cholinesterase measurement is adequate for monitoring workers exposed to triamiphos.

72-0804. Druy, E. G.; Gar, K. A.; Khokhryakova, V. S. (All-Union Res. Inst. of Chemical Means of Plant Protection, Moscow, USSR). **Razlozhenie DDT v pochve pod vliyaniyem mikroorganizmov. [DDT decomposition in soil under the influence of microorganisms.]** *Dokl. Akad. Nauk SSSR 200(4): 977-979; 1971.* (6 references) (Russian)

Soil microorganisms decomposed DDT to DDD, DDE, water soluble, and volatile products under laboratory conditions. The metabolic rate of the microorganisms was significantly higher under anaerobic conditions. DDT detoxication in soil may be increased by creating conditions favorable for the development of microorganisms.

72-0805. Rubenchik, B. L.; Botsman, N. Ye.; Gorban', G. P. (Kiev Research Inst. Hygiene of Nutrition, Kiev, USSR). **O kantserogennom deystvii gerbitsida monurona. [Carcinogenicity of the herbicide monuron.]** *Vop. Onkol. 16(10): 51-53; 1970.* (4 references) (Russian)

Carcinogenicity of monuron was studied in randombred rats and mice and in C57Bl mice. Rats were given daily 450 mg/kg monuron in their diet for 18 months; mice received 6 mg (0.1 LD50) of monuron in milk p.o. once a wk for 15 wk. The experiment carried out on rats lasted 27 months and that on mice lasted 13 months. The first tumor developed in a rat on the 18th wk of the experiment; other neoplasia developed between 68-118 wk after the beginning of the experiment. The first tumors in mice appeared on the 16th and 4th wk of the experiment in the randombred and the C57Bl strains respectively. The liver and lung appeared to be the main target organs for carcinogenesis. The malignant hepatomas elicited a hepatocellular cancer morphology with highly polymorphic cells, giant cells with hyperchromic nuclei along with atypical mitoses and micronecroses. The lung tumors originated in the alveolar cells or in the bronchial epithelial lining. A few gastric tumors developed in the glandular epithelium. Tumor incidence was 46.5% in rats and no neoplasia was found in controls. Incidence of both malignant and benign neoplasia was 56.5% in randombred, 26.9% in C57Bl and 3.9% in C57Bl control mice.

72-0806. Rosic, N.; Milosevic, M. (Dept. of Pharmacology, Medical Faculty, U. of Belgrade, Yugoslavia). **Two-way (shuttle-box) avoidance in rats after paraoxon treatment.** *Activ. Nerv. Super. 13(4): 241-245; 1971.* (8 references)

A marked depression of active avoidance (AA) responses in shuttle-box experiments was noted following administration of 0.3 mg/kg paraoxon in rats, whereas 0.1 mg/kg had no effect. The maximum depression of AA responses was recorded within 4 hours after treatment; this was followed by gradual recovery, with attainment of near-normal performance levels 12 hours after paraoxon injection. In these experiments, pralidoxime was given simultaneously with paraoxon in order to suppress the peripheral effects of the latter. In experiments designed to test the rate of learning of AA, a significant training retardation was observed on the second day in those animals which were trained 2 hours after paraoxon treatment. In all other groups (trained 4, 6, 12, and 24 hours after paraoxon treatment), the treated and control groups learned the AA habit at about the same rate. In fact, on the third day, the performances of the animals trained 12 hours after paraoxon treatment were significantly better than those of the controls. Retardation of reversal learning was observed only in rats trained 4 hours after injection of paraoxon (0.3 mg/kg), not in rats trained 12 hours after injection. Neurochemical analysis revealed that the "free" ACh in the brain was elevated by 173% at 1 hour following paraoxon treatment, then dropped off rapidly, amounting to 90% above the normal value 3 hours later. A further, but more gradual, return toward normal occurred within the succeeding 12 hours, at which point the free ACh value was still 50% above normal. In contrast, the AChE activity in the brain was significantly depressed during the entire 12 hours after paraoxon treatment. The AChE activity drops to 30% of the normal value within 30 minutes after paraoxon administration, and remains at approximately this level for the 12-hour period.

72-0807. Truhaut, R. (Author address not given). **Observations recentes dans le domaine de la toxicologie dite alimentaire. [Recent cases in so-called digestive toxicology.]** *Bull. Acad. Nat. Med. (Paris) 154: 789-800; 1970.* (17 references) (French)

Animal tests, used to ascertain potential risks of

substances present in foodstuffs that are capable of accumulating in human body, cannot always be interpreted unambiguously as different test animals may show different degrees of resistance. *Mesocricetus auratus* (golden hamster) shows a resistance much higher than other animals for DDT. *Mesocricetus auratus* showed various degrees of resistance to oral administration of aldrin, dieldrin, endosulfan, lindane, heptachlor and chlordane, greater in all cases than that of other animals. This phenomenon may be explained by biochemical studies. The importance of the biochemical approach in the evaluation of the toxicological effects is shown by the example of the dithiocarbamate type fungicide for which, due to different interactions, only temporary allowable daily doses could be determined. Toxic synergy was revealed by polysorbate type surface-active substances used as emulsifiers and stabilizers in foodstuffs and food colorants.

72-0808. Mayer, F. L. (Utah State U., Logan, UT). **Dynamics of dieldrin in rainbow trout and effects on oxygen consumption.** *Diss. Abstr. Int. 32(1): 527-B; 1971.*

The uptake and excretion of dieldrin, effect of dieldrin on metabolic rates, and organochlorine insecticide interactions in rainbow trout were investigated. The magnitude of dieldrin uptake was greatest by way of food. Uptake was less through gills than in food and uptake through skin was extremely slow. The majority of excreted radioactivity after oral dosing with ^{14}C-dieldrin was found in feces. Much smaller portions of radioactivity were excreted in urine and through gills. In 48 hr, 3.7 to 13.4% of total radioactivity administered were excreted. No significant effects of dieldrin on standard metabolism, active metabolism, scope for activity, or routine metabolism were apparent. Dieldrin treatment significantly reduced the swimming speed at which trout could maintain themselves. Dieldrin treatment resulted in increased nitrogen content of liver and decreased nitrogen content of kidney. No effect of dieldrin on nitrogen content of brain was apparent. Succinate dehydrogenase activity in liver was inhibited by dieldrin treatment. Succinate dehydrogenase activity became more restricted to the nuclear area of liver cells as dieldrin dose increased. Sublethal interaction studies involving fish simultaneously treated with up to three organochlorine insecticides indicated dieldrin storage was reduced by the presence of either DDT or methoxychlor. Tissue storage of DDT and DDE were greatly enhanced when DDT and dieldrin were feed in combination. Feeding of DDT with methoxychlor resulted in decreased methoxychlor storage and simultaneous doses of dieldrin and methoxychlor caused an increase in methoxychlor storage. In lethal interaction studies, intoxication from doses of DDT, methoxychlor, or DDT and methoxychlor was less with concomitant dieldrin administration than without dieldrin. DDT storage increased with time in the fat body, but brain levels of DDT at which the fish died were very constant. (Author abstract by permission, copies of the thesis are available from University Microfilms order No. 71-19,123)

72-0809. Black, W. D. (U. of Georgia, Athens, GA 30601). **A study of the resistance to organophosphate toxicity produced by the chlorinated hydrocarbon insecticide ovex.** *Diss. Abstr. Int. 32(7): 4116-B. 1972.*

The purpose of this investigation was to find a safe means of increasing the resistance of animals to organophosphate toxicity. Preliminary investigations revealed that 100 mg/kg of ovex (*p*-chlorophenyl *p*-chlorobenzene-sulfonate), having an LD50 of 2050 mg/kg, was capable of increasing the resistance of rats to organophosphate toxicity from 48 to 72 hr after treatment. Investigation of this phenomenon revealed that the increased resistance was not noted in the rabbit. Limited comparison of this protection against organophosphate toxicity with the protection produced by atropine, revealed that ovex was more effective than a single 1 mg dose of atropine (76 ± 3.7 min survival time vs 120 min survival time). Investigation of this phenomenon revealed that there was an increase in the liver weight/body weight ratios of ovex treated rats at 72 hr after treatment. Also there was a concomitant increase (approximately 2 X) in the total α-naphthyl acetate hydrolyzing activity of the liver. The parathion metabolizing activity of liver microsomes from ovex pretreated rats was significantly greater than controls. Parathion and paraoxon residues recovered from the livers of ovex pretreated rats were reduced. It is proposed that increased numbers of organophosphate binding enzymes present in livers of rats pretreated with ovex. These enzymes bind and metabolize greater amounts of parathion and paraoxon, sparing vital acetylcholinesterase elsewhere in the body, thereby reducing the toxicity of agents. (Author abstract by permission, copies of the thesis are available from University Microfilms, Order No. 72-2457)

72-0810. Beug, M. W. (U. of Washington, Seattle, WA 98105). **Carbonic anhydrase: esterase activity, modification kinetics, and pesticide inhibition.** *Diss. Abstr. Int. 32(8): 4479-B; 1972.*

The mechanism of the interaction of carbonic anhydrase with the persistent pesticides DDT, DDE, and dieldrin was exposed in an attempt to understand why these pesticides cause eggshell thinning in birds. Finally, the kinetics of enzyme modification was examined using the very reactive amidination reagent, phenyl-*N*-methylacetimidate. In addition, phenyl-*N*-methylacetimidate proved to be an enzyme substrate, showing for the first time that carbonic anhydrase versatility encompases C=N systems. Contrary to reports in the literature, it was shown that DDT, DDE, and dieldrin are not true inhibitors of carbonic anhydrase esterase or hydrase activity. When the respective solubility limits of

DDT, DDE, or dieldrin were exceeded, carbonic anhydrase from bovine erythrocytes was carried down with or in the precipitates. Mixed crystal formation or surface adsorption by the precipitate did not occur. While precipitation was nearly quantitative in dilute solutions ($<10^{-7}$ *M*), no detectable precipitation from concentrated solutions ($>10^{-6}$ *M*) was observed. It was also found that plant carbonic anhydrase was not subject to coprecipitation. The difference in behavior could be attributed to the fact that while carbonic anhydrases so far isolated from animal sources are monomers, the plant enzyme is a hexamer. The hexameric unit is either too large to be carried down or does not have the proper surface exposed for adsorption to take place. (Author abstract by permission, modified, copies of the thesis are available from University Microfilms, order No. 72-7321)

72-0811. Bourquin, A. W. J. (U. of Houston, Houston, TX). **Microbial interactions with cyclodiene pesticides.** *Diss. Abstr. Int. 32(8): 4752-B; 1972.*

The interactions of a mixed bacterial culture of pseudomonads were investigated particularly concerning the biodegradation of the cyclodiene pesticides. Four isolates were presented in a floc forming culture which gave evidence for, at least, partial degradation of simulated technical heptachlor through isolation of acidic metabolites, evolution of labelled CO2, and isolation of metabolic by-products. Quite unique to the system was the ability of one isolate to grow by fixing CO2 as a carbon source, which was also the same isolate to degrade the pesticide to CO2. At least one isolate (Texas 2) was shown to grow best on acetone, while another (Texas 4) grew best on the acetone-pesticide. Evidence for a proposed biodegradation pathway presented was supplied by identified pesticide metabolites, nine unknown metabolites, and the literature. Results show a tremendous concentration of pesticides by the bacterial system. Experiments show the accumulation to be selective with regard to chlorination. Most significant in this investigation is the mutalistic relationship in the mixed bacterial population. Evidence was presented for a greater biological activity of the mixed culture on the pesticides than in the individual isolates. Although the total degradation achieved, even in the mixed culture, was not tremendously high for the purpose of this study, the results are very encouraging. Action of the organisms on the pesticides was significant and possibly achieved degradation completely to biological compounds. (Author abstract by permission, copies of the thesis are available from University Microfilms, order No. 72-5797)

72-0812. St. Omer, V. V. E. (U. of Guelph, Guelph, Ontario, Canada). **The effect of some chlorinated hydrocarbon insecticides on biochemical changes in brains of female rats and cockerels.** *Diss. Abstr. Int. 32(8): 4774-B-4775-B; 1972.*

Four structurally unrelated organochlorine pesticides (lindane, dieldrin, heptachlor, DDT) were administered to adult female rats and 10- to 12-wk-old cockerels. There was a tendency for the brain tissue rather than the liver to selectively absorb the compounds. The concentration of heptachlor in the brain increased with time whereas the brain levels of the others decreased with time (lindane>dieldrin>DDT). Clinical observations in both rats and cockerels indicated a decreasing order of neurotoxicity: lindane, dieldrin, heptachlor, and DDT. The convulsions induced by the pesticides were more severe in rats than in cockerels. A positive correlation was found between the ammonia levels and the convulsive toxicity of each compound. It appeared that the mechanism for ammonia utilization (the amidation of glutamate to glutamine) was altered. The cockerels seemed, however, capable of converting free ammonia into glutamine more efficiently than the rats. The four organochlorines tested increased the synthesis of acetylcholine (ACh) in the brain of the rats above the mean control level. The increasing levels of ACh were inversely proportional to the neurotoxicity. The data did not support the concept of a facilitating action of high concentrations of ACh in the convulsive seizures induced by organochlorine insecticides. (Author abstract by permission, modified and edited, copies of the thesis are available directly from the National Library of Canada at Ottawa.)

72-0813. Cutkomp, L. K.; Yap, H. H.; Vea, E. V.; Koch, R. B. (Dept. of Entomology, Fisheries, and Wildlife, U. of Minnesota, St. Paul, MN 55101). **Inhibition of oligomycin-sensitive (mitochondrial) Mg^{2+} ATPase by DDT and selected analogs in fish and insect tissue.** *Life Sci. (Pt. II): 10(21): 1201-1209; 1971.* (30 references)

The Mg^{2+} ATPase systems obtained from cockroach muscle and fish brain homogenates display the highest sensitivity to DDT reported for an enzyme system; especially susceptible are the oligomycin-sensitive (mitochondrial) ATPases obtained from these tissues. For example, only 0.16 μM of DDT is required to produce 50% inhibition of cockroach muscle mitochondrial Mg^{2+} ATPase, whereas almost 4 times that amount is required for the same inhibition of total Mg^{2+} ATPase. These inhibition values are much higher than those for comparable quantities with Na^{+}-K^{+} ATPase. The slope of the graph of inhibition of cockroach muscle mitochondrial Mg^{2+} ATPase activity by dicofol was much steeper than that observed for DDT, but with dicofol, no inhibition at all occurred until the concentration was about 11 μM whereas this same concentration of DDT produced nearly 50% inhibition. The effects of dicofol and DDT on fish brain Mg^{2+} ATPases do not differ so greatly as the effects on cockroach muscle Mg^{2+} ATPases. TDE, perthane, methoxychlor, and DDE were approximately 1/2, 1/3, 1/4 and 1/16 as effective in inhibiting mitochondrial (oligomycin-sensitive) Mg^{2+} ATPase in fish brain homogenates as DDT.

72-0814. Douch, P. G. C.; Smith, J. N.; Turner, J. C. (Biochemistry Dept., Victoria U., Wellington, New Zealand). **NADPH-dependent cleavage of carbamates.** *Life Sci. (Pt.II) 10(23): 1327-1333; 1971.* (16 references)

The cleavage of substituted phenylmethylcarbamate insecticides (carbaryl, aprocarb, butacarb) to form the corresponding phenol is considered to be a major means of carbamate insecticide detoxication in vertebtates and insects. Enzyme activities previously detected in certain species, and described as hydrolases, appeared inadequate to account for the quantities of metabolites produced. Therefore, systems capable of cleaving insecticidal carbamate esters to their phenols were sought and characterized. Cleavage was only found in systems to which microsomal cofactors were added, thus indicating that the insecticides are hydrolyzed by a NADPH-dependent microsomal enzyme, the activity of which may vary from one species to another. The observed cleavage rates appear adequate to account for metabolite levels found in the urine of treated animals. The results obtained are in agreement with the findings in the case of ester cleavage of parathion and other organophosphates by a microsomal enzyme system.

72-0815. Kirzon, M. V.; Titov, S. A. (Moscow U., Zoological and Entomological Lab., Moscow, USSR). **Kharakteristika electricheskoy aktivnosti podkorkovykh i stvolovykh struktur krys v protsesse otravleniya ftoratsetatom natriya. [Characteristics of the electric activity of subcortical and truncus structures in rats during sodium fluoroacetate poisoning.]** *Vestn. Mosk. Univ. Biol. Pochvoved. 25(1): 18-25; 1970.* (11 references) (Russian)

White male rats were given i.p. 8 mg/kg sodium fluoroacetate (FA), corresponding to 1.5 minimum LD, to study its effect on electric activity of subcortical and truncal brain structures. The animals exhibited increased motor activity during the first 25 min. following FA administration. Following this, two different patterns were observed. One category of animals developed tremor and tonic contractions of spinal and neck muscles 1-1.5 hr following FA administration; certain rats developed generalized grand-mal type attacks followed by coma, and finally death 10-15 hr following treatment. In the other pathological pattern, there was a depression of motor activity following the first period of excitation. This calm condition lasted 4-5 hrs when clonic spasms, leading to death from asphyxiation, occurred. The nature of the organic factors determining one of the two FA poisoning patterns is unknown. The EEG associated with the depressed motor activity was similar to EEG patterns accurring either after severe hypoxia or after barbiturate intake. These patterns were generated by the reticular nucleus of the thalamus. Another EEG pattern which was associated with the motor depression state consisted of caudate nucleus spindles and was generated with the direct participation of the anterior ventral and reticular nuclei of the thalamus.

72-0816. Manturovskaya, N. V. (Moscow U., Dept. of Lower Plants, Moscow, USSR). **Deystvie simmetrichnykh triazinov na pochvennye griby v chistoy kulture. [The effect of symmetrical triazines on fungi in pure cultures.]** *Vest. Mosk. Univ. Biol. Pochvoved. 25(3): 31-36; 1970.* (7 references) (Russian)

The effects of triazine herbicides (simazine, atrazine and prometryne) were studied on three different genera of fungi. All three triazines affected the fungi, either by retarding the growth only, or by affecting the degree of development of the mycelium or the agamous sporogenesis. Atrazine was most effective in retarding growth while simazine showed the highest toxicity of all. This may be due to the different water-solubilities of these materials. In small doses (0.01, 0.1, 1 kg/ha) all three triazines acted as stimulants in different species. The growth of *Aspergillus flavus*, *Penicillium thomii* and *P. vermiculatum* was stimulated by all three herbicides. Mycelial sectors differing in color developed in some cases, which may indicate a mutagenic effect. The growth rates of *A. flavus*, *A. fumigatus*, *P. vermiculatum*, *P. purpurogenum*, and *Trichoderma lignorum* were only slightly affected by simazine. This may be explained, for *Penicillium purpurogenum*, *Aspergillus fumigatus*, and *Trichoderma viride*, by the fact that simazine is transformed by these species into nontoxic products.

72-0817. Karpenko, V. N. (Kiev Research Inst. of Occupational Hygiene and Diseases, Kiev, USSR). **Issledovaniye gemopoeza i svertyvayushchey sistemy krovi pri intoksikatsii nekotorymi karboaminovymi pestitsidami. [A study on hemopoiesis and blood coagulation in carbamate pesticide poisoning.]** *Vrach. Delo. 1: 130-133; 1971.* (13 references) (Russian)

Quantitative and qualitative changes in the blood-forming elements, bone marrow hemopoiesis and blood coagulation activity were investigated in the rabbit during administration of 1/10 LD50 of Sevin (carbaryl) and TMTD per day for 15 days. Sevin caused no appreciable uniform changes in the blood-forming elements and did not influence hemopoiesis under these conditions, whereas TMTD intoxication resulted in leucopenia, suppression of hemopoiesis, thrombocytopenia and retardation of blood coagulation.

72-0818. Dyadicheva, T. V. (Kiev Research Inst. of Occupational Hygiene and Diseases, Kiev, USSR). **Funktsionalnoye sostoyaniye shchitovidnoy zhelezy i kory nadpochechnikov pri dlitelnom vozdeystvii karbaminovykh pestitsidov. [Functional condition of the thyroid and of the adrenal cortex in chronic treatment with carbamate pesticides.]** *Vrach. Delo 2: 120-123; 1971.* (5 references) (Russian)

A comparative study of the effects of long-term (4-month) administration of pesticidal carbamates of different structural types: Sevin (carbaryl), yalan (EPTC), and TMTD on thyroid and adrenal function was conducted on rats. General and individual features of the action of these pesticides on various endocrine function parameters (radioiodine uptake, 17-ketosteroid excretion, eosinophil counts in peripheral blood, serum and erythrocyte electrolytes) are described. Following an initial enhancement of thyroid function, the effects of the various pesticides differed. Disorders of the androgenous and mineralocorticoid adrenal cortex function were primarily observed. ACTH loading tests indicate a reduction of adrenal cortex functional reserves under the influence of carbaryl, EPTC, and TMTD.

72-0819. Burkatskaya, Ye. N.; Karpenko, V. N. (Kiev Research Inst. Occupational Hygiene and Diseases, Kiev, USSR). **Vliyaniye dinitrofenol'nykh pestitsidov na pokazateli vodnoelektrolitnogo obmena. [Action of dinitrophenolic pesticides on the parameters of water and electrolyte metabolism.]** *Vrach. Delo 2: 126-130; 1971.* (5 references) (Russian)

The action of dinitrophenol pesticides such as dinitrophenol (DNP), dinitro-*o*-cresol (DNOC), dinitroisopropylphenol (DNPP), dinitro-butylphenol (DNBP) and dichloronitrophenol (DCNP) on potassium, sodium, and water metabolism was investigated in rats. Each pesticide was given in 50 mg/kg (single) doses p.o. and the animals were sacrificed 2 hr later for analytical determinations. All compounds produced increases in plasma sodium and potassium levels, except for DNP. Myocardial potassium was increased from DNP, DNOC, DNPP and DCNP. Liver and kidney potassium was decreased from DNP and increased from DNBP. Increased plasma sodium concentrations were accompanied by increased liver, kidney and myocardial sodium levels. Only DNP produced decreased myocardial and liver sodium levels. Myocardial and liver water contents were decreased from DNP, DNOC, DNBP, and DCNP. DNP-treated animals exhibited no substantial alterations in the intracellular and extracellular water distribution. Hyperglycemia was found in all treated animal groups indicating that a certain relationship exists between potassium and carbohydrate metabolism in organisms subjected to the action of dinitrophenolic compounds under the experimental conditions.

72-0820. Poteryayeva, G. Ye. (Odessa Med. Inst. Central Research Lab., Odessa, USSR). **Sanitarno-toksikologicheskaya kharakteristika geksakhlorbutadiyena. [Sanitary and toxicological characteristics of hexachlorobutadiene.]** *Vrach. Delo 4: 130-133; 1971.* (10 references) (Russian)

According to acute and chronic toxicity experiments performed on large groups of rats, mice, guinea pigs, and cats by inhalation, p.o. and topical treatment, hexachlorobutadiene was found to be a polytropic poison. Leucocytosis and lymphocytosis along with a decreased erythrocytic osmosis resistance were ascertained in terms of hematology. An evident displacement of the pH towards acidosis along with decreased vitamin B1 and C levels in the internal organs was observed. Increased residual serum nitrogen and decreased total blood protein levels along with enhanced internal organ transaminase, decreased blood peroxidase and catalase activities were ascertained. Immunological depression including decreased antibody formation potentials along with reduced neutrophil and reticuloendothelial phagocytic capacities constituted another feature of hexachlorobutadiene toxicity. Occupational exposure to the compound should not exceed 4 hr daily, according to prophylactic recommendations.

72-0821. Mizyukova, I. G.; Bakhishev, G. N. (All-Union Research Inst. of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **Spetsificheskoye lecheniye ostrykh otravleniy bromistym metilom. [Specific treatment of acute poisoning with methyl bromide.]** *Vrach. Delo 7: 128-131; 1971.* (5 references) (Russian)

In search of a therapeutic agent against methyl bromide poisoning rats, mice and rabbits were exposed to inhalation of LD50 doses of the fungicide for 30 min. Cysteine appeared to be the most effective therapeutic upon s.c. administration within 30 min following poisoning. Best prophylactic results were achieved when cysteine was administered 30 min before exposure to the fungicide. The specific antidote effect of cysteine against acute methyl bromide poisoning is due to its capability to restore the sulfhydryl group levels and to prevent alterations in protein carboxyl and amino group levels of the animal organism.

72-0822. Rappoport, M. B.; Matokhnyuk, L. A. (Kiev Research Inst. of Occupational Hygiene and Diseases, Kiev, USSR). **Patologomorfologicheskiye i nekotoryye biokhimicheskiye izmeneniya v organizme pri intoksikatsii etilenbisditiokarbamatom margantsa (manebom). [Morphological and biochemical alterations following poisoning with maneb.]** *Vrach. Delo 8: 132-136; 1971.* (5 references) (Russian)

Administration of maneb to rats and cats in single (1200 mg/kg) or daily treatment (300 mg/kg) for 4 months p.o. produced reversible circulatory alterations at the brain level and dystrophic alterations at the parenchymal level, structural alterations of the endocrine system including lipid accumulations in the adrenal cortex, and destruction of spermatogenic epithelial cells in the gonads. Acute inhalational exposure to 700 mg/m^3 maneb concentrations produced central, peripheral or total chromatolysis of subcortical nervous cells of the brain. Chronic inhalation exposure to 4.7 mg/m^3 of maneb for 4 months produced moderate proliferative

foci within the connective tissue of parenchymal and endocrine organs. Daily inhalation exposure to 300 mg/m^3 maneb for 1 month produced overall circulatory alterations along with dystrophic and proliferative foci within the parenchymal organs. Decreased blood SH-group and ceruloplasmin levels along with decreased liver, kidney, and heart succinic dehydrogenase activities were observed under all the above experimental conditions. The alterations in energy metabolism associated with the decreased level of oxidative processes seem to play an essential role in the mechanism of maneb toxicity.

72-0823. Kaemmerer, K. (Institut fuer Pharmakologie, Toxicologie und Pharmazie der Tieraerztlichen Hochschule, Hannover, West Germany). **Zur toxicologischen Bedeutung von Sulfit beim Wiederkaeuer. [The toxicological significance of sulfite fed to ruminants.]** *Zucker 25(4): 123-127; 1972.* (30 references) (German)

Sulfur dioxide and its salts are used in the household as anthelminthics, as food preservatives and for bleaching textiles. In agriculture it is used as a sterilant for wine barrels and as bactericide. The residual sulfur dioxide concentration in food has been limited. The maximum allowable concentrations in the various food products range from 20 to 2000 mg/kg. The effects of sulfur dioxide and their salts on ruminants have been hardly investigated. This might be explained by the fact that ruminants hardly came in contact with sulfur dioxide. Also the tolerance range is large for ruminants. Sulfur dioxide ingested with silo fodder had hardly any visible effects on these animals. A review of the data found in the literature on the tolerance to sulfites (sulfur dioxide, etc.) reveals that emphasis has been placed on the inhalation toxicity of sulfur dioxide. The ruminant tolerates ingestion of considerably larger amounts of sulfites than man or monogastric animals. The pre-rumen system in ruminants acts as a dilution and buffer system.

72-0824. Tarkov, M. I.; Merenyuk, G. V.; Timchenko, L. A. (Moldavian Research Inst. of Hygiene and Epidemiology, Kishinev, USSR). **Vliyaniye dinitroortokrezola na razvitiye nekotorykh saprofitnykh i pathogennykh mikroorganizmov. [The action of dinitro-ortho-cresol on the growth of certain saprophytic and pathogenic microorganisms.]** *Gig. Sanit. 36(3):57-60; 1971.* (6 references) (Russian)

The action of dinitrocresol (DNOC) on red yeast cultures, as representative of soil saprophytes, and on pathogenic microorganisms such as *Salmonella typhimurium* and *Escherichia coli* was studied using a 30% (active substance) preparation of the pesticide. Growth of *Saccharomyces cerevisiae* in liquid media was disrupted by 27 mg/l, concentrations of pesticide which elicited no effects on the pathogenic species. The resistance of *E. coli* was 50-fold and that of *S. typhimurium* was 150-fold as compared to that of yeasts when grown on agar media. In liquid media, both pathogenic populations elicited a 50-fold resistance to the pesticide as compared to the saprophytic population. All microorganisms appeared to be 1.5-9 times more resistant to DNOC when grown on liquid than when grown on solid media. It is assumed that 27 mg/kg amounts of DNOC reaching the soil would produce inhibitory effects on its microflora and, thus, would affect the self-purification processes of the soil.

72-0825. Olefir, A. I. (Kiev Inst. Occupational Hygiene and Diseases, Kiev, USSR). **Deystviye khlorofosa na immunobiologicheskuyu reactivnost' zhivotnykh v eksperimente. [The action of chlorophos on the immunobiological reactivity of experimental animals.]** *Gig. Sanit. 36(3):104-105; 1971.* (7 references) (Russian)

The immunobiological activity of rats subjected to acute (500 mg/kg single dose) or chronic treatment with pure chlorophos (trichlorfon) (25 mg/kg for 4.5 months) p.o. was investigated. Clinical symptoms of poisoning developed 10 min. following acute treatment and disappeared 24 hrs later. Non-specific immunity was evaluated according to serum lysozyme and β-lysine levels, according to the bactericidal activity of serum, saliva, and skin along with the phagocytic activity of the neutrophils and of the reticuloendothelial system. Acute treatment induced immunological depression after the development of the first poisoning symptoms; these immunological conditions lasted much longer than the poisoning symptoms; thus the phagocytic activity of the reticuloendothelial system was decreased for 60 days. Chronic treatment-induced immunological alterations developed during the 2nd wk and lasted through 2 months after end of treatment with no development of poisoning symptoms. The phagocytic activity of the reticuloendothelial system, the bactericidal activity of the skin and the serum lysozyme and β-lysine levels appeared to be the most sensitive among the studied immunological parameters.

72-0826. Belov, L. G. (Saratov Research Inst. Communal Hygiene, Saratov, USSR). **K toksikologogigiyenicheskoy otsenke gerbitsida 4-amino-3,5,6-trikhlorpikolinovaya kislota (Tordon-22K). [Toxicological and hygienic evaluation of the 4-amino-3,5,6-trichloropicolinic acid (Tordon-22K) herbicide.]** *Gig. Sanit. 36(3): 112; 1971.* (Russian)

Treatment of mice, rats, and rabbits with Tordon-22 (a new derivative of α-picolinic acid) p.o. showed its LD50 to be of 1.50, 3.75 and 2.00 g/kg respectively. Chronic treatment (1/10 LD50 daily for 2 months) produced no symptoms of toxicity, although the total dose of the pesticide constituted 5 LD50. However, decreased heart and spleen weights revealed latent toxicity effects. Topical application for 15 days showed no effects on rabbit skin or eyes. Inhalational exposure to herbicide aerosol produced 33% lethality in mice but no lethal

effects in rats. An orientative maximum allowable concentration of 3 mg/m^3 in air was computed for this herbicide.

72-0827. Nayshteyn, S. Ya.; Leybovich, D. L. (A. N. Marzeyev Scientific Research Inst. General and Communal Hygiene, Kiev, USSR). **Vliyaniye malykh doz DDT, γ-GKhTsG i ikh smesi na polovuyu funktsiyu krys i embriogenez. [Low doses of DDT, γ-HCCH and mixtures of these: effect on sexual function and embryogenesis in rats.]** *Gig. Sanit. 36(5): 19-22; 1971.* (8 references) (Russian)

The administration of 0.02 mg/kg DDT, 0.5 mg/kg of γ-HCCH (lindane) or a mixture of 0.05 mg/kg DDT and 0.02 mg/kg lindane affects the reproductive function of female albino rats. The duration of diestrus is increased and/or the duration of estrus shortened, the gestation period is lengthened, the number of fetuses decreased, and the number of dead fetuses increased. Body weight and length gains in offspring of treated animals were lower than those in the control group. On the other hand, animals treated with lindane at 0.05 mg/kg did not appear to differ from the controls in terms of reproductive function. (Author abstract modified)

72-0828. Mukhamedshin, R. A. (All-Union Poultry Disease Research Institute, USSR). **Toksicheskoye deystvie nuvana (DDVF) na organizm kur. [Toxic effect of nuvan (DDVP) on hens.]** *Veterinariya 46(4): 83-86; 1970.* (Russian)

Effects and both pathologomorphological and histochemical alterations caused by nuvan (dichlorvos) were studied on hens. Six test groups of 3-5 hens each, and one control group were treated with different doses. One death occurred 24 hours after the administration of 0.042 mg/kg, and accelerating alterations were found with increased doses. Clinical symptoms consisted in irritation, hypersalivation in the first minutes, and nervous hypersensitivity prior to death. Pathologomorphological examinations revealed dark bloody coloration of different organs, and frequent hemorrhages. Histological investigations revealed necrobiosis and necrosis of liver cells, and lipid accumulations were found in the cytoplasm of the hepatocytes. Lipoid infiltrations were more intensive in hens treated several times than in hens to which a single high dose was administered. Diffuse hemorrhage was found in kidneys, where the blood vessel walls had degenerated. Hemorrhages were found in lung tissues also. Necrobiosis and necrosis of cellular elements was revealed in the brain cortex. Gliocyte count dropped sharply. Total chromatolysis and kariolysis was found in neurons. The altcrations in lipid and water metabolism, and those in synthesis and decomposition of nucleic acids in the cells of the poisoned organism show the increased sensitivity of hens to nuvan.

72-0829. Tokha-El-Sherif, M. M. (Moscow Acadmey of Veterinary Med., Moscow, USSR). **Posledstviya otravleniya ovets khlorofosom. [Sheep poisoning with chlorophos.]** *Veterinariya 46(4): 86-87; 1970.* (Russian)

Protein metabolism along with serum glutamate-oxaloacetate transaminase (SGOT) and serum glutamate-pyruvate transaminase (SGPT) activities were studied in sheep to evaluate the liver function following chlorophos (trichlorfon) poisoning. Intragastric administration of 200 mg/kg chlorophos produced acute toxic hepatitis. Muscle spasms, mouth foaming, enhanced respiration and pain upon touch in the liver area developed 1.5-2hr following poisoning. Serum GOT increased from 27.6 to 159 U/ml (6 times) and, SGPT activity decreased from 11.6 to 2.3 U/ml within 48 hr following chlorophos administration. Acute hepatitis was associated with severe hypoproteinemia and intense positive Lugol tests 48 hr following poison treatment indicating severe alterations of the protein generating function of the liver.

72-0830. Kusevitskiy, I. A.; Kirlich, A. Ye.; Khovayeva, L. A. (Inst. of Nutrition, Academy of Medical Sciences, USSR). **Deystvie maneba i sevina na shchitovidnuyu zhelezu. [The action of maneb and Sevin on the thyroid gland.]** *Veterinariya 46(6): 73-74; 1970.* (Russian)

The effects of maneb on thyroid gland functions were investigated on rats fed with feed to which 5, 10, and 30 gr of maneb was added per kg. In rats treated with 5 mg-dose the weight of the thyroid gland increased by 28% in the seventh month, and dystrophic phenomena were observed in the functional part of the thyroid gland. A serum protein bound iodine (PBI) drop of 18.8% was found in both male and female rats at the end of the experiment. In male and female rats treated with 10 mg-doses thyroid gland weight increases of 28% and 98%, respectively, were found in the fourth month. Proliferative-degenerative action, and then diffuse sclerosis were found. A 10% drop serum PBI was observed in males 4 months after the beginning of the experiment. In rats treated with doses of 30 mg/kg antithyreoid action was revealed; serum dropped by 15% and 32.8% in the fourth month, and by 31.3%, and 56.3% by the end of the experiments in males and females, respectively. Deformation of glandular functional elements due to diffuse proliferation of connective tissue was found. The effects of Sevin (carbaryl) on thyroid gland functions and morphology were investigated in rats with and without additional iodine doses. In rats treated with Sevin doses of 0.7 and 2 mg/kg with iodine addition SPBI increases of 59% and 96% were found. The initial stress condition came to an end gradually after 2.5 months, and symptoms appeared again after 3.5 months. Sevin was found to be of instable effect. More pronounced deformations were present in rats treated in the same manner without additional iodine. SPBI rose to a maximum of 250% after 3.5 month. Reduced thyroid gland activity was caused by Sevin doses of 2.5 and 15 gr per kg, along with a 23.2-29.4% decrease in SPBI.

72-0831. Kirlich, A. E. (Institute of Nutrition Academy of Medical Science, USSR). **Vliyanie maneba na funktsiyu semennikov i yaichnikov. [Effect of maneb on testis and ovaries.]** *Veterinariya 46(6): 93-94; 1970.* (Russian)

Experiments were carried out on rats with maneb in doses of 5, 10, and 30 g per kg, added to feed to study its gonadotoxic effects. Decreases of 6-10% were found in resistivity, life-span, and motility of the spermatozoa. Losses were observed in the weight of the testes after 11-12 months. The same phenomena were apparent in the fourth month in rats treated with a dose of 10 mg/kg. Aggravating degeneration, atrophy, reduced spermatogenesis, and prolongation of cycles were observed. Increases of 35% and 75% were found in the length of cycles in the fourth and seventh month, respectively. Ovary tissue deformations with atrophy were found. Continuous small peroral maneb doses had negative effects on spermatogenesis and ovogenesis, and caused both decreased spermatozoan activity, and degenerative-atrophic deformations in testis and ovary.

72-0832. Nepoklonov, A. A.; Metelitsa, V. K. (All-Union Research Institute of Veterinary Sanitation, USSR). **Gipodermin-khlorofos dlya profilaktiki podkozhnogo ovoda. [Hypoderminchlorophos used in the prophylaxis of the Hypodermatidae.]** *Veterinariya 46(10): 70-72; 1970.* (Russian)

An 11.6% butyric acid and alcohol solution of chlorophos (trichlorfon), called hypoderminchlorophos, was effective against Hypodermatidae larva in the first stages of development but less effective against larva in the second and third stages of development in cows and young cattle. Symptoms of intoxication and a small cholinesterase inhibition was noted in rabbits but this disappeared within one day. In a comparative study of chlorophos and hypodermin-chlorophos, smaller amounts of hypodermin-chlorophos residues were found in the milk.

72-0833. Klenova, A. A. (All-Union Research Inst. of Poultry Diseases, USSR). **Vliyaniye khlorofosa i fosfamida na organism i yaytsa kur. [Chlorophos and phosphamide effects on chicken body and eggs].** *Veterinariya 46(10):89-90; 1970.* (Russian)

Toxicity parameters on chlorophos (trichlorfon) and phosphamide (dimethoate) administered to chickens in minimum toxic, maximum tolerable, LD50 (single dose) or multiple non-toxic doses as well as following external application of 0.5, 1.0 and 5% chlorophos solutions or 0.25 and 1.0% phosphamide solutions were investigated. Clinical course and outcome of the poisoning process varied according to dose and route of administration and appeared to be similar for both preparations. Poisoning symptoms were coincident with a cholinesterase drop of 67-70% and included decreased body temperatures by 0.8-1.6°, loss of appetite, diarrhea, mouth foaming, limb muscle tremor, and enhanced respiration. Histological examination revealed liver hyperemia along with necrotic foci; mononuclear cell proliferation in the spleen and general swelling of the vascular endothelium constituted the other findings. Egg shell resistance decreased by 7-58% and egg weight decreased by 5-19% depending on dosage. Phosphamide residues of 0.6 mg/kg in the egg white and of 1.8 mg/kg in the egg yolk were found 5 days following external treatment with 0.25% solutions. Internal phosphamide administration produced 1.7-2.4 mg/kg residues in the egg white and 1.0-3.0 mg/kg residues in the egg yolk. These residues disappeared within 10-11 days following treatment in both cases. Chlorophos residues could not be detected in eggs. Hemoglobin levels increased by 3-5% following external application and by 27-36% following internal application of either pesticide; this condition lasted for 3-15 days. Total serum protein increased by 10-25% along with alterations in the serum protein fraction ratios developed in all the experimental groups.

72-0834. Ivanovtsev, V. V. (Moscow Academy of Veterinary Med., Moscow, USSR). **Biokhimicheskiye pokazateli myasa kur pri otravlenii lindanom. [Biochemical parameters of chicken meat following lindane poisoning.]** *Veterinariya 47(1):102-104; 1971.* (Russian)

Chickens 10-16 months old were given acute (LD50, LD100) and chronic p.o. doses of lindane Chickens were sacrificed upon appearance of the first clinical symptoms. The largest amounts of residual pesticide were found after chronic treatment indicating the cumulative properties of the compound. Fatty tissue appeared to be the main site of lindane accumulation; liver, lung, kidney, and muscular tissue constituted the other target sites of accumulation. Residues contained in the meat appeared to be resistant to refrigeration (maintenance at +2—4°C for 15 days) as well as to prolonged boiling. Increased pH and decreased acidity-oxidizability coefficients, as compared to control samples, were characteristic for all the treated chicken meat samples. The decreased latter coefficient is indicative of accumulations of globulin and polypeptide catabolism products.

72-0835. Khaitov, R. Kh.; Baymuradov, T. B.; Kadyrov, U. S. (Uzbek Veterinary Research Institute, USSR). **Toksicheskoye deystviye fosfororganicheskikh pestitsidov na zhivotnykh. [The toxic effect of organophosphorus pesticides on animals.]** *Veterinariya 47(4): 81-82; 1971.* (Russian)

Residues of organophosphorus pesticides can remain in crops if harvested before the full detoxication period and can affect animals feeding upon them. A high environmental temperature intensifies pesticide toxicity. The toxic level of methylmercatophos (oxydemeton-methyl) and butyphos (DEF) was studied in rabbits and sheep at temperatures of 40-42°C. The appearance of clinical signs of intoxication and the percentage of death

were directly proportional to the dose in all experiments. In rabbits, LD50 for methylmercaptophos was 104 mg/kg and LD100, 150 mg/kg; for butyphos, LD50 was 170 mg/kg and LD100, 250 mg/kg. An increase in the number of erythrocytes and leucocytes, hemoglobin, blood sugar, and protein levels and a 60-90% cholinesterase inhibition was observed in rabbits treated with methylmercaptophos. Similar results were also obtained with sheep. An 80-95% cholinesterase inhibition and changes in hematologic indices were also observed in sheep treated with butyphos with similar results in rabbits. Pathological and anatomical changes in the gastrointestinal tract were more pronounced with butyphos.

72-0836. Zayteseva, L. D. (Ukrainian Research Inst. of Experimental Veterinary Science, USSR). **Izucheniye patogeneza pri otravlenii zhivotnykh dikrezilom. [Pathogenesis in animals poisoned with dicresyl.]** *Veterinariya 47(2):94-96; 1971.* (Russian)

Dicresyl is a mixture of *m*- and *p*-cresyl esters of *N*-methylcarbamic acid in a 1:1 ratio and is used against cattle ticks. Chronic toxicity of dicresyl was studied in sheep and rats. Symptoms of intoxication were observed shortly after the introduction of dicresyl but became less apparent with prolonged treatment. Changes in the gastro-intestinal tract, lungs, and other organs were observed in rats. Lambs born of ewes treated with dicresyl were normal but dicresyl residues were found in the placenta, milk, and later in the muscles and kidneys of the lamb. Cresol, a metabolic product of dicresyl, was also found in the latter. Dicresyl and cresol were not found in a lamb whose mother had not been treated with dicresyl for three days. The level of ascorbic acid and the phagocytic activity of leucocytes were sensitive tests for dicresyl poisoning in sheep.

72-0837. Mukhamedshin, R. A.; Mamleyev, S. R.; Babkin, A. G.; Perevoznikov, M. A. (All-Union Research Inst. of Poultry Diseases USSR). **O toksichnosti alkilsevina-67 dlya kur. [Toxicity of alkyl sevin-67 for chickens.]** *Veterinariya 47(7):87-89; 1971.* (Russian)

Toxicological parameters of alkyl sevin-67 (2-methyl-α-naphthyl-*N*-methyl carbamate) were studied on chickens. One series of chickens was treated p.o. with doses ranging from 300 to 700 mg/kg (administered in oily emulsion) through 1000-2000 and 3400 mg/kg (administered in water suspension). Another set of experiments included external treatment with optimum doses of the insecticide external treatment with optimum doses of the insecticide (25 ml/hen of a 0.7% solution) as well as p.o. treatment with 91, 1000 and 3800 mg/kg doses. The first poisoning symptoms following oily suspension treatment developed ½ hr later. Clinical symptoms included enhanced breathing, motion alterations, limb paralysis along with diarrhea and clonic spasms before death. Water suspension treatment produced similar symptoms but with a minor delay. Chickens treated with optimum insecticide doses (externally) elicited no alterations in brain cholinesterase activity (ChE). Internal treatment with 91 mg/kg produced brain ChE drops by 64%, 1 hr and by 45%, 3 hr following treatment. Normal levels of enzyme activity were restored 6 hr following treatment and the higher doses induced drastic effects upon ChE levels, corresponding to peak incidences in mortality of the experimental chickens. In all the experimental chickens which died from poisoning, hyperemia of liver, kidney, brain, spleen, lung, heart coronaries, and adrenals was observed along with severe inflammatory processes of the intestinal mucosa. In addition, administration of the insecticide in oily emulsion produced greyish-white necrotic foci in the liver. The insecticide was found to have no cumulative properties.

72-0838. Grant, D. L.; Villeneuve, D. C.; McCully, K. A.; Phillips, W. E. J. (Res. Labs., Food and Drug Directorate, Tunney's Pasture, Ottawa K1A OL2, Ontario, Canada). **Placental transfer of polychlorinated biphenyls in the rabbit.** *Environ. Physiol. 1(2): 61-66; 1971.* (10 references)

When the PCBs, Aroclor 1221 and 1254, were given orally to does during gestation they were found to cross the placenta of rabbits. The doe's liver had a lower concentration than the fetal liver. It was found that PCB residues in the tissue of does and fetuses depend on the dose of PCB given; the larger the dose the greater the PCB residue. Aroclor 1254 was found to accumulate to a greater extent in the tissue than Aroclor 1221.

72-0839. Villeneuve, D. C.; Grant, D. L.; Khera, K.; Clegg, D. J., Baer, H.; Phillips, W. E. J. (Res. Labs., Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa, Canada). **The fetotoxicity of a polychlorinated biphenyl mixture (Aroclor 1254) in the rabbit and in the rat.** *Environ. Physiol. 1(2):67-71; 1971.* (11 references)

Rabbits, for the first 28 days of gestation, were dosed orally with 1 or 10 mg/kg/day of Aroclor 1254 and rats from the 6th to 15th day of gestation were given 6.25-100 mg/kg/day and no fetotoxic effect was noted. Abortions were induced, however, by doses of 12.5 to 50 mg/kg/day and were fetotoxic to rabbits when treated for the first 28 days of pregnancy. The rabbit fetus was more sensitive to toxic effects of Aroclor 1254 than the rat fetus.

See also 72-0664 72-0687 72-0722 72-0723 72-0724 72-0762 72-0861

72-0840. Ishikawa, K.; Shinohara, R.; Akasaki, K. (Animal Health and Toxicological Lab., Kumiai Chemical Ind. Co., Ltd., Kikugawa, Shizuoka, Japan). **Studies on the behavior of thiocarbamate herbicides in soil. Part I. Gas chromatographic determination of 4-chlorobenzyl *N,N*-diethylthiolcarbamate (benthiocarb) in soil.** *Agr. Biol. Chem. 35(8): 1161-1165; 1971.* (9 references)

Benthiocarb was determined in soils by gas-liquid chromatography using a flame photometric detector. Steam distillation was used to remove benthiocarb from the soils followed by liquid chromatography on active charcoal. The limit of detection for the residues in soil was 0.02 ppm and for the pure material 0.002 μg. When treated with three levels of 0.32, 3.18, and 31.8 ppm, the average recoveries ranged from 70.5 to 93.1%. At the 0.32 ppm level the recoveries were low.

72-0841. Bogacka, T. (Dept. of Water Protection, Water Economics Res. Inst., Gdansk, Poland). **Zastosowanie 4-aminoantypiryny do kolorymetrycznego oznaczania pochodynch kwasow chlorofenoksyalkilowych w wodzie. [Application 4-aminoantipyrine to colorimetric determination of chlorophenoxyalkyl acid derivatives.]** *Chem. Anal. (Warsaw) 16(1): 59-64; 1971.* (9 references) (Polish)

Herbicides such as 2,4-D, MCPA and 2,4-DP can be determined colorimetrically (when concentrations exceed 0.02-0.08 mg/l) by applying 4-aminoantipyrine. The herbicide is extracted with ethyl ether from 1 liter of water followed by coupling of the phenyl ether by pyridine hydrochloride to phenol derivatives which are determined colorimetrically with 4-aminoantipyrine. This method cannot be used to determine mixtures of herbicides owing to variations in color response. Natural waters contaminated with 2,4-D from the environment and natural waters to which herbicides have been added have been tested by this method. The standard deviation ranges from 3.5 to 8.5%.

72-0842. Bogocka, T.; Taylor, R. (Dept. of Water Protection, Water Economics Res. Inst., Gdansk, Poland). **Ozgaczanie herbicydow 2,4-DP i MCPP w wodzie metoda chromatografii cienkowarstwowej. [Determination of herbicides 2,4-DP and MCPP in water by thin-layer chromotography.]** *Chem. Anal. (Warsaw) 16(1): 215-218; 1971.* (3 references) (Polish)

The thin-layer chromatographic method reported previously (*Chem. Anal. 15: 143; 1970*) for the determination of 2,4-DP and MCPA has been modified for the determination of 2,4-DP and MCPP. The ethyl ether extract is purified on a column of silicic acid and the herbicides are separated on silica gel-kieselguhr (2:3) with light petroleum-acetic acid-kerosene (10:1:2) as solvent. The sensitivity of the compounds is 3 μg/l; the average recoveries of 2,4-DP and MCPP are 85.7% and 87.4%, respectively, and the corresponding standard deviations are 13.9 and 15.5%.

72-0843. Zerbe, J.; Kurasiak, K.; Çiesliczak, A. (Lab. of Quality Inspection Office, Poznan, Poland). **Oznaczanie pozostalosci chlorowanych weglowdorow w zbozach, produktach i paszach zbozowych. [Determination of chlorinated hydrocarbon residues in cereal products and feeds.]** *Chem. Anal. (Warsaw) 16(5): 1061-1066; 1971.* (8 references) (Polish)

The procedure of Mills *et al.*, previously reported, (*J. Ass. Offic. Agr. Chem. 46: 186; 1963*) is used for the extraction and cleanup of chlorinated pesticide residues in cereal products. A sample is extracted with 35% water-acetonitrile mixture, diluted with water, and extracted with petroleum ether. The residues are purified by chromatography on a Florisil column by elution with a mixture of petroleum and ethyl ethers. Gas chromatography is used to determine the residues. Recoveries of lindane, *p,p'*-DDE, and *p,p'*-DDT were measured by electron-capture gas chromatography. Average recoveries at 0.2 ppm and 0.4 ppm level for lindane were 96.9 and 97.3%, respectively; for *p,p'*-DDE at 0.5 ppm and 1.0 ppm the recoveries were 95.1 and 98.8%; for *p,p'*-DDT at 0.5 ppm and 1.0 ppm were 87.2 and 86.1%, respectively. The level of residues only slightly influenced the precision of the method.

72-0844. Szokolay, A.; Uhnak, J.; Madaric, A. (Forschungsinstitut fuer Hygiene, Bratislava 1, Czechoslovakia). **Gaschromatographische Bestimmung der Rueckstaende von Insektiziden im Milchfett nach einstufigem Isolationsverfahren. [Gas chromatographic estimation of chlorinated insecticide residues in milk fat after one-step isolation procedure.]** *Chem. Zvesti 25(6): 453-459; 1971.* (22 references) (German)

A gas chromatographic method has been developed for the detection of organochloride residues in milk fat. The method involves an isolation procedure (extraction and purification with 15 g of florisil) and demands 0.3 g of weighed milk fat. The yields for DDT, DDE, and BHC were 81.0 to 91.8%. The accuracy of the method as assessed by standard deviation was 0.022 to 0.098 cm^2 and variation coefficients ranged from 5.4 to 15.3%.

72-0845. Shafik, M. T.; Sullivan, H. C.; Enos, H. F. (Perrine Primate Res. Branch, Dept. of Health, Education and Welfare, Box 490, Perrine, FL 33157). **A method for determination of low levels of exposure to 2,4-D and 2,4,5-T.** *Int. J. Environ. Anal. Chem. 1: 23-33; 1971.* (10 references)

The development of a method for analytical determination of trace quantities of 2,4-D, 2,4,5-T, and their free acid derivatives, 2,4-DCP and 2,4,5-TCP, in human and rat urine permits the detection of low-level exposure. The method comprises the steps of acid hydrolysis of phenolic conjugates at 100°C for 1 hour, extraction of free phenols and acids, ethylation with diazoethane, cleanup of the derivatized urine extract on a

silica gel column, and electron-capture gas chromatographic determination. Recovery rates for herbicides and derivatives added to control urine averaged from 90 to 98%. When rats were given 10^{-1}, 10^{-2}, 10^{-4} or 10^{-5} LD50 of 2,4-D or 2,4,5-T per day for 3 days, the urinary excretion rates were found to be dependent upon the dose administered, decreasing with increasing dosage from 75 to 28% for 2,4-D and from 100 to 49% for 2,4,5-T. The majority of the 2,4-D administered was recovered unchanged in the urine, whereas in the case of 2,4,5-T, at least three metabolites were excreted in addition to 2,4,5-TCP. Analysis of urine from occupationally exposed humans revealed urinary levels of 0.19 to 0.10 ppm for 2,4-D and 0.05 ppm to 3.6 ppm for 2,4,5-T. Limits of detection in rat urine were: 2,4-D, 0.05; 2,4,5-T, 0.01; 2,4-DCP, 0.10; and 2,4,5-TCP, 0.01 ppm.

72-0846. Chen, J.-Y. T.; Dority, R. W. (Div. of Chemistry and Physics, Food and Drug Administration, Washington, DC 20204). **Infrared studies of DDT, structurally related halogenated pesticides, and some metabolites.** *J. Ass. Offic. Anal. Chem. 55(1): 15-31; 1972.* (10 references)

Reference IR spectra of 29 purified halogenated pesticides are presented. The spectra were recorded with micro quantities of the purified pesticide compounds to facilitate identification of pesticide residue isolates. The compounds included DDT and related structures. The observed characteristic frequencies are tabulated in correlation tables, and their significance is interpreted in terms of the substituents and of the electromesomeric and mass effects of the substituents. The relevance of these effects to the stability and persistence of this class of pesticides is noted. (Author abstract by permission)

72-0847. Stalling, D. L.; Tindle, R. C.; Johnson, J. L. (Fish-Pesticide Res. Lab., Bureau of Sport Fisheries and Wildlife, U.S. Dept. of the Interior, Columbia, MO 65201). **Cleanup of pesticide and polychlorinated biphenyl residues in fish extracts by gel permeation chromatography.** *J. Ass. Offic. Anal. Chem. 55(1): 32-38; 1972.* (18 references)

Gel permeation chromatography was found to be an efficient and reproducible technique for removing lipids from fish extracts. Recoveries of DDT, DDD, DDE, methoxychlor, lindane, dieldrin, endrin, malathion, and parathion were found to be greater than 95%. Pesticide concentrations were equivalent to 0.01-1.0 ppm, based on the original fish tissue. Pesticide analysis was by gas chromatography, using an electron capture detector, and by liquid scintillation. Less than 0.5% of the lipids originally present in the fish extract was recovered in the pesticide-containing eluate. Several solvent and lipophilic gel systems were evaluated. A chromatographic system using cyclohexane and Bio Beads S-X2 gave the most satisfactory separations. Polychlorinated biphenyls were also recovered in good yields. When this technique was used in conjunction with the polychlorinated biphenyl separation technique of Armour and Burke, excellent results were obtained. The system, as described, may be adapted for automatic sample cleanup and may be used as the sole cleanup technique with some samples. (Author abstract by permission)

72-0848. Mills, P. A.; Bong, B. A.; Kamps, L. R.; Burke, J. A. (Div. of Chemical Technology, Food and Drug Administration, Washington, DC 20204). **Elution solvent system for Florisil column cleanup in organochlorine pesticide residue analysis.** *J. Ass. Offic. Anal. Chem. 55(1): 39-43; 1972.* (6 references)

An elution solvent system is presented which can replace the currently used mixtures of ethyl ether-petroleum ether in the Florisil column chromatographic cleanup for pesticide residue analyses. Three eluants consisting of different mixtures of methylene chloride, hexane, and acetonitrile give greatly improved cleanup for extracts of fats and oils and recover pesticide chemicals of a greater range of polarity than do the ethyl ether-petroleum ether eluants. Fifty chemicals are known to be essentially completely recovered. Data are presented on fractional elution of representative compounds and on efficiency of removal of fatty substances. The proposed system has performed satisfactorily as a replacement for the ethyl ether-petroleum ether eluants in the analyses of a variety of representative foods for organochlorine pesticides. (Author abstract by permission)

72-0849. Firestone, D.; Ress, J.; Brown, N. L.; Barron, R. P.; Damico, J. N. (Div. of Chemistry and Physics, Food and Drug Administration, Washington, DC 20204). **Determination of polychlorodibenzo-*p*-dioxins and related compounds in commercial chlorophenols.** *J. Ass. Offic. Anal. Chem. 55(1): 85-92; 1972.* (7 references)

Twenty-one commercial chlorophenols were examined for the presence of polychlorodibenzo-*p*-dioxins (chlorodioxins) and related compounds. The chlorophenols were dissolved in aqueous alkali, extracted with petroleum ether, and fractionated on an alumina column. Alumina fractions were examined by electron-capture gas chromatography and combined gas chromatography-mass spectrometry. Chlorodioxin content was estimated by electron capture gas chromatography. The presence of chlorodioxins, polychlorodibenzofurans (chlorofurans), and polychlorodiphenyl ethers (chloroethers) was confirmed by combined gas chromatography-mass spectrometry. The 2,3,7,8-tetrachlorodioxin was found in 3 of 6 samples of 2,4,5-trichlorophenol but was not detected in any of the 11 samples of tetra- and pentachlorophenol that were examined. Hexachlorodioxin was present at levels ranging from 0.17 to 39 ppm in all 8 pentachlorophenols examined. Hexa-, hepta-, and octachlorodioxins as well

as a wide variety of chlorofurans and chloroethers of varying chlorine content were present in most of the tetra- and pentachlorophenols. In addition, the gas chromatographic-mass spectrometric data suggested that some of the chlorophenols contained methoxy- and dimethoxypolychlorofurans and methoxypolychloroethers as well as polychlorohydroxybiphenyl. (Author abstract by permission)

72-0850. Konickova, J.; Wadso, I. (Thermochemistry Lab., Chemical Center, U. of Lund, S-220 07 Lund 7, Sweden). **Use of flow microcalorimetry for the determination of cholinesterase activity and its inhibition by organophosphorus pesticides.** *Acta. Chem. Scand. 25(6): 2360-2362; 1971.* (6 references)

Flow microcalorimetry is the present technique used to determine cholinesterase activity and its inhibition by the organophosphorus pesticide dimefox. This method is found to be precise and well suited for automated analytical procedures.

72-0851. Murano, A. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-ku, Osaka-shi, Japan). **[Determination of carbamate insecticides by ultraviolet spectrophotometry.]** *Bunseki Kagaku (Jap. Anal.) 19(7): 946-950; 1970.* (17 references) (Japanese)

By using thin-layer chromatographic separation and ultraviolet spectrophotometry a quantitative analytical method has been developed for some technicals and several formulations. A solution of carbamate sample was applied to silica gel plate, developed with *n*-hexane: ethyl acetate:formic acid (80:20:1), eluted with methanol and hydrolyzed with potassium hydroxide. A corresponding phenol was produced and determined by its absorbance at maximum wavelength between 290 mμ and 300 mμ. The standard deviation for 3,4-dimethylphenyl *N*-methylcarbamate, 3,5-dimethylphenyl *N*-methylcarbamate, 3-methylphenyl *N*-methylcarbamate and 2-*sec*-butylphenyl *N*-methylcarbamate was about 0.4%.

72-0852. Murano, A. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-ku, Osaka-shi, Japan). **[Colorimetric determination of 3-methylphenyl *N*-methylcarbamate with 4-aminoantipyrine.]** *Bunseki Kagaku (Jap. Anal.) 19(8): 1074-1077; 1970.* (4 references) (Japanese)

A colorimetric method for the determination of 3-methylphenyl *N*-methylcarbamate (MTMC) has been developed. Thin-layer chromatography was used to separate MTMC from impurities, followed by ethanol elution, and hydrolyzed with potassium hydroxide. MTMC was spectrophotometrically determined by its absorbance at 495 mμ after color development with 4-aminoantipyrine and potassium ferricyanide at pH 8.3. The results of analysis were 1% lower than previously reported. PTMC (4-methylphenyl *N*-methylcarbamate) was not separated from MTMC an its color was not developed with 4-aminoantipyrine, therefore, gas chromatographic determination indicated that its content in MTMC was about 1% just in accordance with the difference between the value by two methods. PTMC did not interfere in the determination of MTMC by the proposed method.

72-0853. Murano, A. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-ku, Osaka-shi, Japan). **[Determination of 3,4-dimethylphenyl *N*-methylcarbamate and 3-methylphenyl *N*-methylcarbamate in mixed formulations.]** *Bunseki Kagaku (Jap. Anal.) 19(8): 1077-1080; 1971.* (2 references) (Japanese)

A quantitative analytical method has been developed for the determination of 3,4-dimethylphenyl *N*-methylcarbamate (MPMC) and 3-methylphenyl *N*-methylcarbamate (MTMC) in mixed formulations. Chloroform was used for extraction of both MPMC and MTMC, thin-layer chromatography for separation, ethanol for elution, and a potassium hydroxide solution for hydrolysis. The total carbamate content was determined by measuring the absorbance at 296.5 mμ, which was an isobestic point of MPMC and MTMC. MTMC was determined colorimetrically after the reaction with 4-aminoantipyrine at pH 8.3, and MPMC was determined from the difference between total carbamate content and MTMC content. This method gave precise and reproducible results.

72-0854. Murano, A.; Nagase, M. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-ku, Osaka-shi, Japan). **[Colorimetric determination of *S*-benzyl-*O*-*n*-butyl-*S*-ethyl phosphorodithioate and some other organophosphorus pesticides.]** *Bunseki Kagaku (Jap. Anal.) 20(6): 665-672; 1971.* (16 references) (Japanese)

Thin-layer chromatographic separation and colorimetry have been presented for the determination of *S*-benzyl-*O*-*n*-butyl-*S*-ethyl phosphorodithioate (Conen). A sample of Conen solution was spotted on a silica gel plate and consequently developed with *n*-hexane: dioxane:isopropyl ether (80:10:5) and *n*-hexane: dioxane:tetrahydrofuran (80:15:5) followed by methanol elution. Perchloric acid and nitric acid were used to decompose Conen to inorganic phosphoric acid, color was formed with ammonium vanadomolybdate and determined by measuring its absorbance at 420 mμ. The type and volume of eluting agent and amount of perchloric acid in the digestion procedure influenced the analytical results. The standard deviation was 0.45%. Other organophosphate pesticides were also determined by this method.

72-0855. Murano, A.; Nagase, M. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-ku, Osaka-shi,

Japan). **[Thin-layer chromatographic separation and ultraviolet spectrophotometric determination of *O,O*-dimethyl-*O*-(*p*-cyanophenyl) phosphorothioate and *O*-ethyl-*O*-(*p*-cyanophenyl) phenylphosphonothioate.]** *Bunseki Kagaku (Jap. Anal.) 20(6): 672-677; 1971.* (5 references) (Japanese)

A method using thin-layer chromatographic determination and ultraviolet spectrophotometry has been developed for the determination of *O,O*-dimethyl-*O*-(*p*-cyanophenyl) phosphorothioate (cyanox) and *O*-ethyl-*O*-(*p*-cyanophenyl) phenylphosphonothioate (surecide). A sample solution was spotted on a silica gel plate, developed with *n*-hexane:chloroform:acetone (5:1:1) eluted with methanol and with the addition of a sodium hydroxide solution hydrolyzed to liberate *p*-cyanophenol. By measuring the absorbance of the tested solution at the maximum wavelength of 275 mμ the cyanox or surecide content was determined. The results obtained were reproducible.

72-0856. Murano, A.; Nagase, M. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-Ku, Osaka-shi, Japan). **[Gas chromatographic determination of *S*-benzyl-*O*-butyl-*S*-ethyl phosphorodithioate in technical products and its formulations.]** *Bunseki Kagaku (Jap. Anal.) 20(6): 732-734; 1971.* (Japanese)

A quantitative method by gas-liquid chromatography has been developed for *S*-benzyl-*O*-butyl-*S*-ethyl phosphorodithioate (Conen). An apparatus equipped with a hydrogen flame ionization detector was used to separate Conen from impurities and determined by using benzylbutylphthalate as an internal standard. The impurities in technical Conen were identified by comparing their retention times with those of authentic samples. After extraction with chloroform Conen in its formulations was determined. Analytical results were accurate and precise.

72-0857. Murano, A.; Horiba, M. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-ku, Osaka-shi, Japan). **[Gas chromatographic determination of geometrical isomers of allethrin and phthaltrin.]** *Bunseki Kagaku (Jap. Anal.) 20(7): 789-791; 1971.* (7 references) (Japanese)

A gas chromatograph equipped with a hydrogen flame ionization detector was used to completely separate the geometrical isomers of allethrin and phthalthrin. Analysis of the synthetic mixtures of the isomers indicated that *trans-cis* ratios of allethrin and phthalthrin could be determined exactly by their peak area ratios.

72-0858. Murano, A.; Doi, T.; Nagase, M. (Osaka Works, Sumitomo Chemical Co., Ltd., Konohana-ku, Osaka-shi, Japan). **[Gas chromatographic determination of new fungicidal cycloimides, dichlozoline and dimetachlone.]** *Bunseki Kagaku (Jap. Anal.) 20(7): 792-795; 1971.* (3 references) (Japanese)

Gas-liquid chromatographic methods for the determination of new fungicidal cycloimides, 3-(3′,5′-dichlorophenyl)-5,5,-dimethyloxazolidine-2,4-dione (dichlozoline) and *N*-(3,5-dichlorophenyl)succinimide (dimetachlone), have been developed. An apparatus equipped with a hydrogen flame ionization detector was used to separate both dichlozoline and dimetachlone from their impurities and determined by use of internal standards. One of the impurities of dimetachlone, *N*-(3,5-dichlorophenyl) succinimic acid (DSA), was partly changed to dimetachlone during the operation and eluted on a gas chromatograph. The contents of DSA in technical products of dimetachlone were too low to interfere with the determination. Dichlozoline and dimetachlone were both determined accurately and precisely in technical samples and several formulations.

72-0859. Kroeller, E. (Bundesgesundheitsamt, Max von Pettenkofer-Institut, Abteilung Lebensmittelchemie, Berlin-Dahlem, Germany). **Untersuchungen zur Restmengenbestimmung von Thiabendazol auf den Schalen von Apfelsinen. [Investigations on the determination of thiabendazole residues on orange peel.]** *Deut. Lebensm.-Rundsch. 67(7): 229-231; 1971.* (4 references) (German)

Establishment of a tolerance for the fungicide thiabendazole on citrus fruits in the European Economic Community will require the development of a determination method. Extraction of this fungicide from orange peels is particularly difficult, and requires shaking with methylene chloride, then dilute hydrochloric acid, and shaking of the acid extract again with methylene chloride to separate thiabendazole from interfering materials. Thin-layer chromatography provides final separation; the filtered TLC eluate is reduced with zinc dust, and the sulfhydryl group formed is reacted with *p*-phenylenediamine to yield a dye, related to methylene blue, whose extinction is then measured spectrophotometrically. Residues of 0.1 to 1.0 ppm can be determined.

72-0860. Gutsche, B.; Ruediger, K.; Herrmann, R. (Abteilung fuer Medizinische Physik, Gaffkystrasse 14, Giessen, Germany). **Zur Rueckstandsanalyse von phosphor- und schwefelhaltigen Insektiziden mit einem Flammenspektrometer. [Analysis of residues of phosphorus and sulfur-containing insecticides with a flame spectrometer.]** *Deut. Lebensm.-Rundsch. 68(1): 13-15; 1972.* (4 references) (German)

A simple flame spectrometric method without water-cooling has been developed for use in mobile laboratories which carry out the analyses of residual phosphorus and sulfur-containing insecticides directly in the fields. The apparatus has been described elsewhere. The method is based on evaporation of the samples from a platinum loop into the middle part of the burner of a hydrogen/compressed-air flame with separated combus-

tion zones. The precision of the method is improved by means of mechanical guidance of the loop. A total of 20 individual measurements were taken with 1 μl methanol containing 8 μg trichlorofon as well as with 1 μl methanol containing 12 μg mercaptodimethur (Mesurol). From the determined peaks a standard deviation of ± 31.8% was calculated for phosphorus and of ± 1.8% for sulfur. For insecticides whose S-concentration was double the concentration of phosphorus an accurate P-analysis was still feasible. If the S-concentration was higher, a correction of the P-values was necessary. For insecticides with seven times as much phosphorus as sulfur, an accurate sulfur analysis was still feasible.

72-0861. Irukayama, K.; Kuwahara, S. (Dept. of Hygiene, Kumamoto U. Medical School, Kumamoto, Japan). **[Studies on the combination of methylmercury with the protein of egg white.]** *Nippon Eiseigaku Zasshi (Jap. J. Hyg.) 26(3): 291-297; 1971.* (6 references) (Japanese)

Experiments were performed in an attempt to isolate and characterize the protein fraction from egg white which combines with methylmercury incorporated into the egg. Eggs containing the methylmercury-protein complex were obtained by subcutaneous injection of methylmercuric chloride to laying hens. Egg white powder was prepared by treatment with ether and acetone, then dissolved in water and the methylmercury-containing protein precipitated with 30-60% ammonium sulfate. The protein was redissolved by dialysis, then fractionated on Sephadex G 100. The protein fractions were further fractionated by electrophoresis on cellulose acetate; mercury was contained in the albumin fraction. Alternatively, the original egg white protein solution was fractionated by disc electrophoresis on polyacrylamide gel (pH 9.4). Fractions with high protein-mercury contents were lyophilized, and the lyophilized powder redissolved in veronal buffer-saline solution, then analyzed by ultracentrifugation (60,000 rpm). The calculated sedimentation constant was 3.44×10^{-13} m/sec (dyne/g); V was taken as 0.748. (Author abstract modified)

72-0862. Spielholtz, G. I.; Toralballa, C.; Steinberg, R. J. (Dept. of Chemistry, Herbert H. Lehman Coll. of the City U. of New York, Bronx, NY 10468). **Determination of arsenic in coal and in insecticides by atomic absorption spectroscopy.** *Mikrochim. Acta (6): 918-923; 1971.* (21 references)

Because of its specificity, simplicity and high sensitivity the atomic absorption spectroscopy method was adopted for the determination of arsenic in coal and insecticide samples. Liquid insecticide samples needed no preliminary separation or sample treatment. Both the normal aspiration procedure and the sampling boat technique were used. The latter method was found to have a definite advantage over aspiration because it requires only a fraction of a ml of sample whereas the aspiration method requires a minimum of 10 ml. The detection limit is about five times that for the normal aspiration method. By the sample boat technique arsenic concentrations in the 0.1 to 0.4 μg range could still be determined. A check on the recovery of arsenic was made by oxidizing samples of arsenic trioxide with the perchloric acid plus periodic acid oxidation procedure. Samples were mixed with 10 ml of 72% perchloric acid plus 40 mg of periodic acid and boiled to dense white fumes of perchloric acid. The solutions were cooled, diluted with water and analyzed by atomic absorption spectroscopy. The method is rapid and efficient.

72-0863. Rosales, J. (Ciba-Geigy AG, Werk Monthey, Switzerland). **Bestimmung von Herbiciden der Klasse der *N*-Methoxy-*N*-methyl-*N'*-phenylharnstoffe. [Determination of herbicides of the *N*-methoxy-*N*-methyl-*N'*-phenyl urea class.]** *Fresenius Z. Anal. Chem. 256(3): 194-196; 1971.* (2 references) (German)

The herbicides to be determined are mixed with 10 ml of 90% phosphoric acid and dissolved by heating to 50° or 60°C and shaking. The solution is then heated in an oil bath to 150°C and stirred at brief intervals during the first five minutes. Carbonic acid formation sets in. After 15 minutes at 150°C the mixture is cooled, diluted with 100 ml of a mixture of cold potassium bromide, glacial acetic acid and water and the resulting aniline and *N*-methoxy-*N*-methylamine are titrated polarovoltrically with sodium nitrite. Small amounts of included by-products are determined gas chromatographically after hydrolysis.

72-0864. Becker, A.; Heizler, W. (Analytische Laboratorien der Ciba-Geigy AG, Basel, Switzerland). **Zur Bestimmung von Carbamaten. 2-(1,3-Dioxolan-2-yl)-phenyl-*N*-methyl-carbamat in Reaktionsgemischen. [The determination of carbamates. 2-(1,3-dioxolane-2-yl)-phenyl-*N*-methylcarbamate in reaction mixtures.]** *Fresenius Z. Anal. Chem. 257(2): 125-129; 1971.* (11 references) (German)

Hydrolysis procedures for carbamates have been investigated, using 2-(1,3-dioxolane-2-yl)-phenyl-*N*-methylcarbamate as an example. Phosphoric acid (85% w) and potassium hydroxide in propylene glycol are suitable hydrolyzing agents. Due to the elevated reaction temperature, hydrolysis is fast. A method applicable to the determination of 2-(1,3-dioxolane-2-yl)-phenol-*N*-methylcarbamate is based on direct conversion of the acetal group to the related oxime, with hydroxylamine hydrochloride as reagent. Salicyl aldehyde and 2-(1,3-dioxolane-2-yl)-phenol, which are potential by-products, give the same reaction. They form a colored iron(III)-complex and can thus be determined. (Author abstract by permission)

72-0865. Hawkins, K. I.; Knittle, C. E. (Denver Wildlife Res. Center, Bureau of Sport Fisheries and Wildlife, Denver, Co 80225). **Comparison of acetylcholinesterase determinations by the Michel and Ellman methods.** *Anal. Chem. 44(2): 416-417; 1972.* (5 references)

Tests were performed to determine the comparability of results obtained with the Michel and the Ellman methods for determination of acetylcholinesterase (AChE). The Michel method requires a sensitive pH meter and relatively large samples; the Ellman method, a good laboratory spectrophotometer and micro-size samples. In addition, with the Ellman method, the incubation time required is shorter and the use of quinidine eliminates interference from plasma (pseudo)AChE. The tests were performed on homogenates from quail brain, and the AChE activity in the brains of some of the birds was reduced by administration of fenitrothion prior to the test. Correlation for the results obtained by the two methods was very good (correlation coefficient, 0.99), and the margin of error was around 10% for both. The investigator may use whichever method is convenient.

72-0866. Bonelli, E. J. (Finnigan Corp., 595 N. Pastoria, Sunnyvale, CA 94086). **Gas chromatograph/mass spectrometer techniques for determination of interferences in pesticide analysis.** *Anal. Chem. 44(3): 603-606; 1972.* (6 references)

The qualitative and quantitative analysis of PCBs can be best achieved by gas chromatography/mass spectrometry. This method enables analysis without prior column chromatography or complete separation on a gas chromatographic column. The technique of peak monitoring can be used to identify and quantitate components of overlapping gas chromatographic peaks present in amounts < 10 ng.

72-0867. Runser, D. J. (U. of Iowa, Iowa City, IA). **Plasma in analytical chemistry: A new radiofrequency electrodeless discharge cell for studying the emission spectra of organic molecules. The feasability of a one step method of analysis for chlorinated pesticides in inert matrices.** *Diss. Abstr. Int. 32(8): 4459-4460-B; 1972.*

A radio-frequency electrodeless discharge cell was developed for studying the emission spectra of organic molecules. This medium pressure source is stable and reproducible with and without sampling; and, is self-initiating. Low and medium resolution spectra of aromatic and non-aromatic chlorinated hydrocarbons and chlorinated pesticides were studied between 2000 and 4500A, and 2000 and 3400A respectively. A modified direct current discharge source was also constructed and compared with the radio-frequency source for the same study. The feasibility of a one step method of analysis for chlorinated pesticides in inert matrices was investigated using the radio-frequency discharge source. Pesticide identification was made by monitoring the 2780A CCl radical emission band, characteristic of chlorinated hydrocarbons in gas discharges. The absolute detection limits found for DDT in samples of alumina and soil are 5.9 μg and 8.2 μg, respectively. The identified spectral species of DDT in the gas discharge were C, C2, CC1, Cl2 and C6H6. A preliminary study of the plasma decomposition products of DDT was also made. (Author abstract by permission, copies of the thesis are available from University Microfilms, order No. 72-8317)

72-0868. Supin, G. S.; Ivanchenko, V. V. (All-Union Research Institute of Chemical Means for Plant Protection, Moscow, USSR). **Primeneiye polyarografii dlya opredileniya ostatochnykh kolichestv fosfororganicheskikh pestitsidov. [The use of polarography in determining organophosphorus pesticide residues.]** *Gig. Sanit. 36(3): 76-79; 1971.* (45 references) (Russian)

Literature on using polarography to analyze microquantities (up to 10^{-7} moles/l of various organophosphorus pesticide residues is reviewed. Substances with an easily reduced or oxidized group (nitrophenol derivatives) or with an absorption on mercury electrodes which changes relative to the charge applied are suitable for polarography. The use of polarography variations (chromato-, oscillo-, and monocyclical polarography) with substances considered unsuitable for the usual polarography is discussed. Experiments with many organophosphorus pesticides and fresh and canned fruit, plant tissue, and soil are cited.

72-0869. Kulikov, V. I.; Botvin'yeva, A. M.; Sidenko, I. N. (Belorussian Research Institute of Hygiene and Sanitation, Minsk, USSR). **Opredeleniye eptama i tillama v produktakh pitaniya metodom gazo-zhidkostnoy khromatografii. [Gas-liquid chromatography determination of Eptam and Tillam in food products].** *Gig. Sanit. 36(4): 70-72; 1971.* (2 references) (Russian)

Residual quantities of Eptam (*S*-ethyl-*N*,*N*'-dipropylthiocarbamate, EPTC) and Tillam (*S*-propyl-*N*-ethyl-*N*-butylthiocarbamate, pebulate) were determined simultaneously in sugar beets and potatoes by use of gas-liquid chromatography. The liquid phase was 15% polyethylene glycol on pulverized diatomaceous earth; hydrogen gas was the carrier gas and a thermal conductivity detector was used. The herbicides were steam distilled from sugar beets in glacial acetic acid, extracted into petroleum ether and then chromatographed. The method is rapid (2 to 3 hr) and its sensitivity is 0.01 mg/kg. As little as 1 to 2 μg of the compounds can be detected. Use of a flame ionization detector increased the sensitivity of the method to 0.1 to 0.2 μg/kg for each of the two compounds. Beet samples collected from Eptam-treated fields contained residual amounts ranging from 0.05 to 0.1 mg/kg.

72-0870. Uporova, G. I.; Shtyler, S. Yu. (Regional Sanitation and Epidemiologic Department, Smolensk, USSR). **Iz opyta raboty po opredeleniyu DDT i geksakhlorana v produktakh pitaniya metodom tonkosloynoy khromatografii s flyuorestseinom. [Determination of DDT and hexachlorane in food products by thin-layer chromatography with fluoresceine.]** *Gig. Sanit. 36(4): 97-98; 1971.* (1 reference) (Russian)

The method of determination of DDT and hexachlorane (BHC) in food products is described. The pesticides are extracted into an organic solvent, which is then purified with sulfuric acid and thin-layer chromatographed on a sorbent containing fluoresceine. After plate development in *n*-hexane, the sample is irradiated with UV for 1 hour. Standard solutions of DDT and hexachlorane are developed and irradiated along with the samples. The amount of pesticides in the sample is determined by visual comparison of intensity and size of dark-violet spots on yellow-green background of a plate with those of standards. The preparation of chromatographic plates is described in detail, as is the process of extraction and purification of milk products, fats, fruits, vegetables, and other foods. The method is simple and accurate, if pesticide amounts in sample do not exceed 10 μg. Sensitivity of the method is 0.2 and 0.5 micrograms of DDT and hexachlorane respectively.

72-0871. Dranovskaya, L. M.; Lyalikov, Yu. S.; Filippov, M. P. (Moldavian SSR Acad. of Sciences, Inst. of Chemistry, Kishinev, USSR). **Opredeleniye dikhlordifeniltrikhloretana (DDT) v vozdukhe spektrofotometricheskim metodom. [Determination of DDT in air by spectrophotometry.]** *Gig. Sanit. 36(5): 59-60; 1971.* (Russian)

Trapping of DDT from the air can be made either by means of 2 consecutive absorbers, with 5 ml *n*-hexane each, or a series of 2 corrugated tubes filled with silica gel can be used. Air is passed through the absorbers at a 1 l/hr rate in both cases. The solvent is then removed from the absorber and an aliquot part of the homogenized solution is subjected to spectrophotometry at a λ of 236 mμ. If silica gel was used for absorption three washings with 15ml of an organic solvent should be made and proceeded as above. The amount of DDT contained in the sample is then deduced from a calibration curve. The procedure allowed to achieve measurements of 0.15 mg/m^3 DDT in the air.

72-0872. Supin, G. S.; Vayntraub, F. P.; Makarova, S. V. (All-Union Research Inst. Chemical Plant Protection, Moscow, USSR). **Opredeleniye mikrokolichestv dinitroortokrezola v vode ostsillopolyarograficheskim metodom. [Determination of dinitro-ortho-cresol in water by oscillographic polarography.]** *Gig. Sanit. 36(5): 61-62; 1971* (5 references) (Russian)

4,6-Dinitro-*o*-cresol (DNOC) is determined in water samples by the polarographic procedure used for air, plant, soil, or blood samples. To increase the sensitivity of the procedure single-impulse oscillography with a slow-drip capillary tube (1 drop/10 sec) is used. The background solution is prepared with 20 g borax and 8 g KCc in 11 of water, and sodium sulfite is added for the removal of oxygen. The method is sensitive to 0.06-0.1 μg/15 ml DNOC, however, the optimum concentrations are between 0.2 and 1.0 μg/15 ml

72-0873. Kosmatyy, Ye. S.; Tret'yak, M. G. (Ukrainian Research Inst. of Plant Protection, Kiev, USSR). **Polyarograficheskoye opredeleniye sayfosa v vode. [Determination of sayfos in water by polarography.]** *Gig. Sanit. 36(5): 62-63; 1971.* (1 reference) (Russian)

Water samples (200 ml) are acidified with 2ml concentrated HCl to pH~1, then washed 4 times with 50 ml of *n*-hexane and once with 50 ml of chloroform. After neutralization with 50 ml of 3*M* sodium acetate solution and washing with *n*-hexane, sayfos (menazon) is then extracted 3 times with 50 ml of chloroform and the collected extracts are distilled to dryness on a water bath. The dry residue is dissolved in 0.2 ml of acetone and then 0.8 ml of 0.5*N* HCl is added to wet the container walls and to be used as a polarography background. The sample is transferred into the cell and oxygen is removed with hydrogen (10 min.). Polarography is performed within the -0.2 and -1.2 v. range. Lowest detection limit: 12.5 μg sayfos in 200 ml water.

72-0874. Rozin, D. G.; Bekmayeva, A. D. (Andizhan Regional Sanitary and Epidemiological Station, Andizhan, USSR). **O neprigodnosti metoda tonkosloynoy khromatografii pri indikatsii aldrina v pishchevykh produktakh. [Unsuitability of thin-layer chromatography for identification of aldrin in food products.]** *Gig. Sanit. 36(5):106-107; 1971.* (Russian)

The use of TLC for the determination of aldrin in food products has been criticized because of its Rf which coincides with DDE. In addition, digestion of meat samples with H2SO4 has produced certain sulfur containing compounds with Rf and silver ammonium nitrate reaction similar to those specific for aldrin. Included are experimental data obtained from raw and boiled meat samples extracted with hexane and subjected to no previous digestion with H2SO4. False positive aldrin results seemed to be due to certain amino acids liberated by protein hydrolysis.

72-0875. Troshko, Ye. V.; Debelyy, A. S. (All-Union Research Institute of Medical Plants, Moscow Region, USSR). **Opredeleniye ostatochnykh kolichestv dikhloral'mocheviny v nekotorykh rasteniyakh. [Determination of dichloral urea residues in plants.]** *Gig. Sanit. 36(5): 105-106; 1971.* (Russian)

A method of quantitative determination of dichloral urea in medicinal plant materials is described.

Method is based on the reaction of substances with three chlorine atoms attached to a single carbon atom, which give colored compounds with pyridine in an alkaline medium. An acetone extract of raw material was passed through chromatographic column to remove colored flavons. The filtrate was discarded and dichloral urea was eluted from the column with diluted HCl. Pyridine was then added to acidic eluate and dichloral urea concentration was determined by measuring absorption intensity at 530 nm. Absorption intensity depended linearly on concentration of dichloral urea in the concentration range of 0.01-10 mg/ml. The method was applied in determination of residual amount of dichloral urea in a peppermint crop. Small amounts of the herbicide were found in the first crop, none in the second.

72-0876. Skrinde, R. T. (Author address not given). **Addendum to review of 1970 literature. Analytical methods.** *J. Water Pollut. Contr. Fed. 43(7): 1550-1557; 1971.* (55 references)

An addendum to a review of 1970 literature on analytical methods for pesticides, among other water pollutants, includes eight additional references. Reported are an improved method for extraction of organochlorines and organophosphates from lake water; a number of techniques for determination of organophosphate pesticides in waste-water effluent and river water; method of extracting insecticide residues from mud, water weeds, fish, duck tissues, insects, and crustacea and a method for analysis of chlorinated hydrocarbon pesticides (lindane and endrin) from lake water microparticulate matter. Thin-layer chromatography was found to be increasingly useful for pesticide analysis. A method for analysis of DDT, BHC, aldrin, and dieldrin in river water in microgram/l concentration is reported. Also mentioned are a method of determining Abate in distilled water, surface water, and diluted settled waste water, as well as a semiquantitative method for DDT, methoxychlor and lindane in water.

72-0877. Green, R. E.; Corey, J. C. (Savannah River Lab., E. I. duPont de Nemours & Co., Aiken, SC 29801). **Pesticide adsorption measurement by flow equilibration and subsequent displacement.** *Soil Sci. Soc. Amer. Proc. 35(4): 561-565; 1971.* (12 references)

Pesticide adsorption studies using the batch equilibration method have provided some useful information, but fall somewhat short in terms of the precision of results, and in some cases give results which are too high, because of the disruption of soil aggregates. Therefore, a flow equilibration method was developed. The pesticide solution (here, a 200 μmole/liter solution of ^{14}C-labeled diuron or atrazine) was permitted to flow into 1 g of soil in weighed tubes fitted with coarse fritted-glass plates for 2.5 hours. Then the soil was drained by gravity or suction, and the tubes dried to remove excess solution from the glass, and reweighed. Entrapped solution weighed 0.2-0.6 g. The tubes were then connected to a reservoir supplying the appropriate displacing solvent: acetone for diuron and methanol for atrazine. The ^{14}C content of the resulting solution was determined by liquid scintillation counting. Displacement efficiency values were calculated. Desorption was also tested by placing solutions of low pesticide concentrations in contact with the equilibrated soil samples for 19.5 hours. An apparent time lag in desorption was found, which could cause inaccuracies in results obtained with the batch method if the concentration change during adsorption was very large. The increased precision attained with the flow equilibration method suggests that it might be used in deriving isotherms, the shape of which could predict mechanisms probably responsible for adsorption.

72-0878. Seifert, J.; Davidek, J. (Dept. of Food Chemistry and Analysis, Faculty of Food and Biochemical Technology, Technicka 1905, Prague 6, Czechoslovakia). **Enzymatic and polarographic determination of metation (metathion, fenitrothion) and its analogues after separation on silica gel thin layers.** *J. Chromatogr. 59(2): 446-447; 1971.* (8 references)

In order to use more effectively the samples in the analysis of organophosphate insecticides, specifically, metathion (fenitrothion), a combination of two analytical procedures was used: enzymatic determination of the inhibition effect of metathion on esterases and polarographic determination of metathion. A mixture of metathion (*O,O*-dimethyl-*O*-(4-nitro-3-methylphenyl) phosphorothionate) and its analogs, metaoxon (*O,O*-dimethyl-*O*-(4-nitro-3-methylphenyl) phosphate), *S*-methyl isomer, and bis-(*p*-nitromethylphenyl) isomers was separated on silica gel layers before polarographic measurements. The enzymatic source was beef liver homogenate and the visualization reagent was β-naphthyl acetate. After chromatographic separation of metathion and its analogs, a planimetric semiquantitative evaluation of the total inhibition can be calculated. The actual percentage composition of the samples analyzed is determined polarographically from the same chromatographic plates. The presence of unreacted β-naphthyl acetate does not interfere with the subsequent polarographic determination. The standard deviation of the semiquantitative enzymatic determination is ± 20% while that of the polarographic determination is ± 6%.

72-0879. Geike, F. (Biologische Bundesanstalt fuer Land-und Forstwirtschaft, Institut fuer Pflanzenschutzsmittelforschung, DI Berlin 33, Germany). **Duennschichtchromatographisch-enzymatischer Nachweis einiger Pestizide durch Hemmung der Amylase-Aktivitaet. [Thin-layer chromatographic-enzymatic detection of some pesticides via inhibition of amylase activity.]** *J. Chromatogr. 63(2): 343-347; 1971.* (11 references) (German)

The goal of the present investigation was two-fold:

first, to study the suitability of amylases for the selective TLC detection of some pesticides; and second, to obtain information on the degree of inhibition of these enzymes by pesticides. The pesticides were chromatographed in cyclohexane (organochlorines) or benzene-acetone (carbamates), then immediately or following UV irradiation sprayed with enzyme and incubated. After spraying with starch solution and a further incubation, the plates were tested for enzyme inhibition (blue color) by spraying with iodine solution. Both γ- and β-amylase were inhibited by all 17 organochlorine insecticides tested, the β- more strongly in most cases. Of the 9 insecticidal carbamates studied, none inhibited γ-amylase, and only carbaryl inhibited β-amylase weakly. In the case of the 12 herbicidal carbamates studied, β-amylase was inhibited by all of the *N*-phenylcarbamates except phenmedipham, and by the thiocarbamates diallate and triallate, whereas none of these substances inhibited α-amylase. Upon ultraviolet irradiation, the organochlorines underwent a slight intensification of amylase inhibition, whereas the carbamates showed the opposite effect.

72-0880. Cochrane, W. P.; Wilson, B. P. (Analytical Services Section, Plant Products Div., Canada Dept. of Agriculture, Ottawa, Ontario, KIA OC5, Canada). **Electrolytic conductivity detection of some nitrogen containing herbicides.** *J. Chromatogr. 63(2): 364-369; 1971.* (8 references)

Retention times relative to parathion and detector response levels are tabulated for some nitrogen-containing herbicides and other pesticides in gas chromatography employing the Coulson electrolytic conductivity detector (CCD). The herbicides examined belonged to the substituted urea, *s*-triazine and carbamate or thiocarbamate classes. The data obtained from CCD analysis can be a very useful adjunct to data obtained from organochlorine residue analysis in the case of some herbicides and fungicides. System parameters and modifications required for quantitative and qualitative analysis of certain pesticide groups are discussed. Anomalous solvent peaks initially observed in some cases were found to be due to water, which gave a CCD response via leaching of basic absorbent from the scrubber.

72-0881. Bishara, R. H.; Born, G. S.; Christian, J. E. (Analytical Development Dept., Eli Lilly and Co., Indianapolis, IN 46206). **Thin-layer chromatography of DDT and some related compounds on aluminum oxide chromatoplates.** *J. Chromatogr. 64(1): 135-145; 1972.* (30 references)

The chromatographic behavior of DDT and related compounds, metabolites, analogs, and degradation products on commercially available pre-coated aluminum oxide thin-layer chromatoplates was investigated using 33 solvent systems. The color and/or fluorescence response of the DDT-type compounds and their sensitivity to a chromogenic reagent consisting of ammoniacal silver nitrate and 2-phenoxyethanol in acetone is discussed. A total of 11 compounds of the mixture were separated by two-dimensional thin-layer chromatography on aluminum oxide plates. (Author abstract by permission).

72-0882. Geike, F. (Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Institut fuer Pflanzenschuzmittelforschung, Dl Berlin 33, Germany). **Duennschichtchromatographisch-enzymatischer Nachweis von Carbamaten. III. Nachweis insektizider und herbizider Carbamate mit Phosphatase. [A thin-layer chromatographic-enzymatic assay of carbamates. III. Detection of insecticidal and herbicidal carbamates with phosphatase].** *J. Chromatogr. 64(2): 383-387; 1972.* (11 references) (German)

Relatively little is known as yet concerning the effects of insecticidal and herbicidal carbamates on various enzymes, with the exception of the cholinesterases. In the present report, the phosphate-inhibiting properties of the carbamates were tested by thin-layer chromatography. All of the insecticidal carbamates tested inhibited alkaline phosphatase, but the limits of detection by this method were rather high; in contrast to findings obtained with bovine liver esterase, UV irradiation changes the results obtained in this test only insubstantially. The limit of detection of insecticidal carbamates with acid phosphatase is considerably more favorable, but fails by far to reach the values attained with bovine liver esterase. Detection of herbicidal carbamates with both alkaline and acid phosphatase is substantially better than that of insecticidal carbamates—in fact, about a power of ten better. The use of naphthyl phosphate for detection increases the sensitivity for some insecticides substantially, but not for others.

72-0883. Gesink, R. W.; Akerman, J. W.; Hurtt, W. (Plant Sciences Laboratories, USA Biological Defense Research Center, Fort Detrick, Frederick MD). **Alfalfa seed bioassay for aqueous solutions of Orange.** *Proc. West. Soc. Weed Sci. 24: 27; 1971.*

A bioassay method for the herbicide Orange (50:50 mixture of butyl esters of 2,4-D and 2,4,5-T) was developed, employing the germination of alfalfa seeds and providing a standard curve sensitive from 0.02 to 0.40 ppm in water. The curves were developed by germinating alfalfa seed in Petri dishes on filter paper moistened with 2.5 ml of herbicide solutions at concentrations of 0.02-0.06 ppm. The combined lengths of root and shoot were measured 72 hours after germination, and the mean lengths (from 90 seeds at each concentration) as a percentage of controls plotted as a function of concentration. The method is rapid and simple, and gives reproducible results.

72-0884. Ardatova, A. N.; Nikolayev, A. V. (All-Union Inst. Experimental Veterinary Med. USSR). **Opredeleniye grandozana i drugikh pestitsidov v moloke. [Determination of granosan and other pesticides in milk.]** *Veterinariya 46(4): 119-120; 1970.* (Russian)

A method for the quantitative determination of granosan and other organomercurials in milk samples is presented. Digestion of a 50 ml milk sample is carried out (following addition of ethyl alcohol) with a mixture of concentrated nitric, chloric and sulfuric acid. The digested sample is then extracted with distilled water and treated with a solution of sodium sulfite and a suspension of copper iodide. A 1.0% solution of sodium sulfate is then used for quantitative transfer of the copper iodide precipitate on to a filter paper. Washing of this precipitate is carried out with the same sodium sulfite solution until total disappearance of yellow color in the washing liquid is achieved. The precipitate is then treated (3 times) with a 0.35% iodine solution in a 3% potassium iodide solution and the solution thus obtained ($Cu_2(HgI_4)$) is transferred into a test tube and its color is compared with a standard scale 20 minutes later. Sensitivity of the method is 2 μg/sample, the precision is 80%.

72-0885. Nikolayev, A. V.; Trondina, G. A. (All-Union Inst. of Experimental Veterinary Med. USSR). **Kolorimetricheskoye opredeleniye metilnitrofosa v vode. [Determination of methyl nitrophos in water by colorimetry.]** *Veterinariya 47(1): 111; 1971.* (Russian)

A method for the quantitative determination of methyl nitrophos (MN, fenitrothion) in water samples, based on its extraction with diethyl ether and colorimetry of its alkaline hydrolysis product is presented. Fifty ml aqueous samples are extracted twice with 30 ml and 20 ml of diethyl ether in a separatory funnel. The collected extracts are dried first with anhydrous sodium sulfate (5 g for 20-30 min), then filtered and evaporated to dryness on a water bath at 40°C. The residue is treated with 2.5 ml of a 0.1*N* NaOH solution and heated on a boiling water bath for 10 min. A yellow color develops due to *p*-cresolate generated by alkaline hydrolysis of MN. Colorimetry of the sample, cooled to room temperature, is performed at 400 mμ with a blue filter. A 0.1*N* NaOH solution is used as a control. Quantitative determination of MN is made by reading the corresponding value from a previously prepared calibration curve. The procedure for the preparation of the calibration curve is included. Optical densities for amounts ranging between 5-50 μg/sample obey Lambert-Beer's law. Interference is produced by the presence of *p*-nitrophenol, *p*-nitrocresol, metaphos, thiophos and other nitro-group containing pesticides. However *p*-nitrocresol and *p*-nitrophenol can be removed by washing of the ether extract with a diluted alkaline solution.

72-0886. Zabolotnyy, K. F.; Metelista, V. K.; Nepoklonov, A. A. (All-Union Research Inst. of Veterinary Sanitation USSR). **Vyyavleniye ftalofosa v moloke i myase metodom tonkosloynoy khromatografii. [Detection of phthalophos in milk and meat by thin-layer chromatography.]** *Veterinariya 47(5): 103-104; 1971.* (Russian)

A method for the determination of phthalophos (Imidan) residues in milk or meat samples by means of TLC (on aluminum oxide: gypsum, 97:3 layers) is described. Extraction of the pesticide is performed with acetone (20 ml) on 10 ml milk or 10 mg meat samples following homogenization with 2-3 ml of acetone in the latter case. Samples are kept in acetone at room temperature for 1 hr and then centrifuged at 8000 rpm for 15 min. The water-acetone layer is filtered through paper into a separatory funnel and treated with 20 ml of chloroform. The separated bottom layer including the chloroform-acetone phase is then filtered and evaporated to dryness on a water bath. The residue is dissolved in 0.5 ml acetone and applied on the TLC plate. Migration occurs in a hexane: methanol system (19:1). The plates are saturated with a 20% NaOH solution (by spraying) followed by a 1% $AgNO_3$ water solution spray 10 min. later. Phthalophos appears as a dark gray spot on a white background with an Rf of 0.62 under the above conditions. In computing the amount of residue contained in the sample a 50% extraction yield has to be accounted for.

72-0887. Solov'yeva, L. F. (Research Inst. of Apiculture USSR). **Method obnaruzhehiya sevina v mede, perge i trupakh pchel. [Method of Sevin detection in honey, bee bread and bee carcasses.]** *Veterinariya 47(8): 101-103; 1971.* (Russian)

A method for the detection of Sevin (carbaryl) in honey, bee bread, and bee carcass is presented and applied to stüdy the eventual transfer of the pesticide from contaminated pollens into the bee hive. Sevin is extracted with an organic solvent such as benzene, chloroform or acetonitrile and the purified extract is then subjected to TLC on aluminum oxide layers using chloroform as the carrier solvent. Development of the chromatoplate is made by spraying with sulfanilic acid diazide in alkaline solution. Sensitivity of the method is of 0.5 μg Sevin per sample. Description of the preparation of reagents and of chromatoplates and of the equipment involved is included. According to further determinations, the bees carry Sevin along with nectar and pollen into their hives. Sevin residues in honey and bee bread persist at 5°C and 17° to 21°C temperatures for 6 to 9 months.

See also 72-0702 72-0708 72-0716 72-0721 72-0795

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